Terminals GALILEOSKY GLONASS/GPS Satellite v4.0 User's manual

Firmware 0223

Quality

Reliability

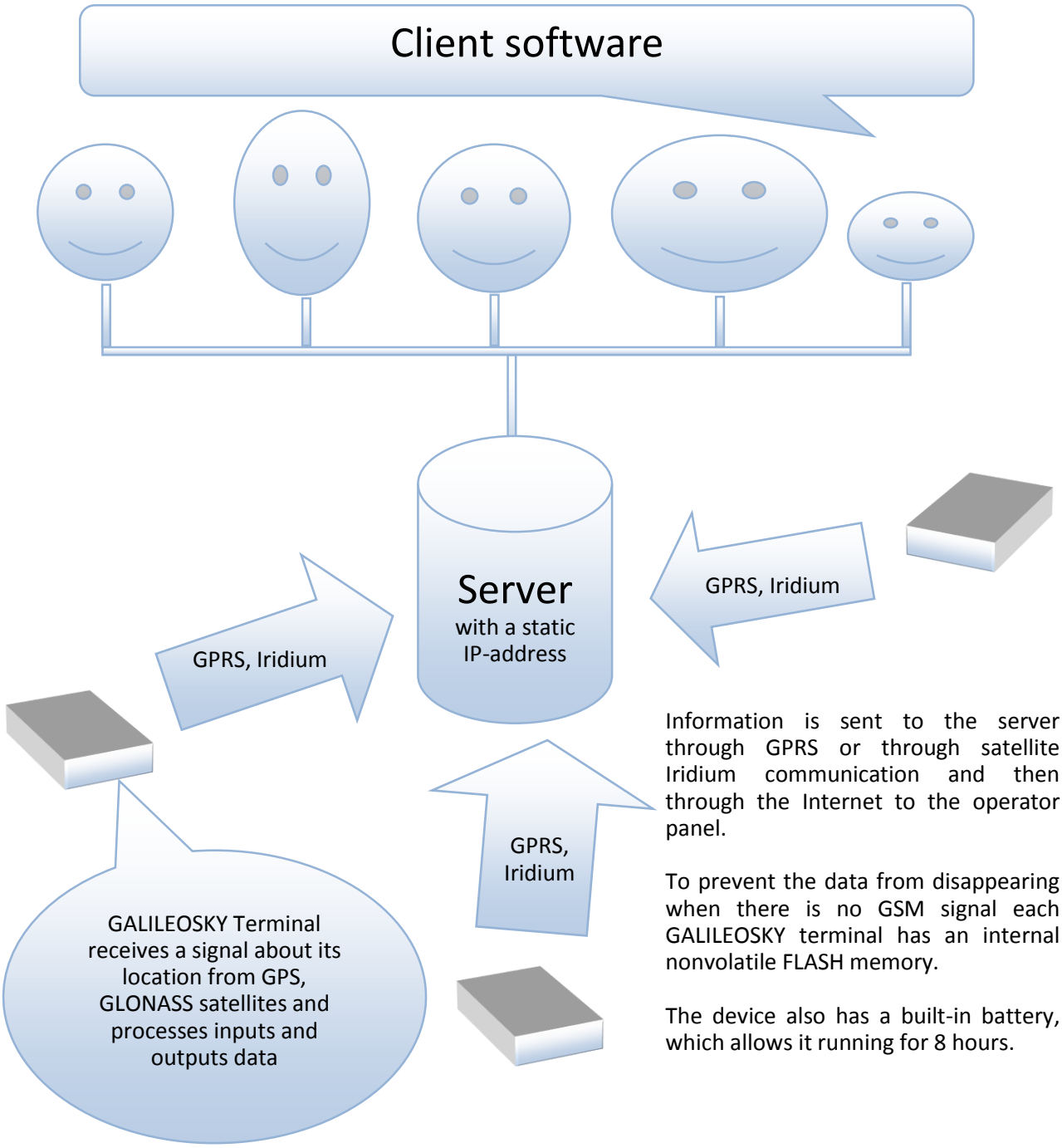
Simplicity

GALILEOSKY

Contents

Introduction

GalileoSky Ltd. produces GALILEOSKY terminals for GPS and GLONASS monitoring of vehicles in real time. The Terminals determine the mobile object location recording the time and route as points with geographical coordinates and send the data to the server to be further processed and sent to the traffic controller panel.
In addition, a number of other vehicle parameters are recorded: the state of analog and discrete inputs of the terminal, the state of digital interfaces.
The Terminals can be used in any vehicle.



Information is sent to the server through GPRS or through satellite Iridium communication and then through the Internet to the operator panel.

To prevent the data from disappearing when there is no GSM signal each GALILEOSKY terminal has an internal nonvolatile FLASH memory.

The device also has a built-in battery, which allows it running for 8 hours.

The terminal provides the following opportunities:

- ✓ Vehicles monitoring in real time;
- ✓ A detailed turn by turn track (without any extra points in a straight track);
- ✓ Voice communication with the traffic dispatcher;
- ✓ GSM enabled remote software update;
- ✓ Continuous troubleshooting of the Terminal through the USB port;
- ✓ Car alarm and a remote engine start;
- ✓ Securing facilities against intrusion;
- ✓ Automatic stops announcement;
- ✓ Adjusting the Terminal through SMS, GPRS, USB;
- ✓ And others (see sections Terminal units performance and Connecting external peripheral).

The information sent by the terminal includes:

- ✓ The exact Greenwich time and date;
- ✓ Vehicle coordinates: latitude, longitude, height;
- ✓ Vehicles speed and direction;
- ✓ Vehicle acceleration;
- ✓ Temperature inside of the device;
- ✓ Inputs (buttons) and analog sensors state;
- ✓ External digital sensors state (fuel, temperature sensors and etc.);
- ✓ Discrete outputs state;
- ✓ And others (see details of transmitted data in section GalileoSky protocol)

In addition, the company provides warranty service and technical support on its site and forum.

Before starting the work study the instruction carefully.

1 *Package*

The standard package includes the GALILEOSKY terminal (hereinafter referred to as the Terminal) and a pin connector with contacts. Everything extra should be bought separately.

1. **GSM aerial connector**
2. **GLONASS aerial connector**
3. **Iridium aerial connector**
4. **microSD**
5. **USB slot**
6. **SIM 0**
7. **SIM 1**

The Terminal has 4 LED indicators which show its current status: red (external power supply), yellow (microcontroller), green (GPS or GLONASS receiver), and blue (GSM modem). **See** section **LED indicators.**

You will also need:

1. USB-cable	1
2. GLONASS aerial	1
3. GSM aerial	1
4. Iridium aerial	1
5. Power supply unit	9V-39V (15W)1

2 *Technical specifications*

Parameter	***Description***
Analog-discrete and pulse frequency inputs	*6 pcs;* *Voltage range – 0-33 V;* *Maximum measured frequency – 3,5 kHz;* *Input resistance of every input is 14 kOhm to the ground.*
Transistor outputs (output 0/1)	*4pcs;* *Maximum voltage – 30 V;* *Maximum current 80mA.*
Battery type	*Li-Ion battery; 600mAh;*
Average power consumption	*1,6 W*
ADC resolution in bits	*10*
Archive capacity	*up to 58000 points by having 2 MB flash memory;* *up to 450000 points by having16 MB flash memory;* *up to 2500000 points for each GB by using micro SD card*
1-Wire	*yes*
CANBUS	*J1939, FMS, J1979, OBD II, 29- bit and 11-bit identifiers*
RS485	*1*
USB 2.0	*Terminal setting, troubleshooting, reflashing*
microSD	*support of cards of up to 32GB*

Speaker (Autoinformer)	*built-in*
The number of Geofences for voice prompts	*Limited by the micro-SD card capacity*
Speaker output type	*analog (linear output), 250mW*
The size of a data packet sent by the device	1. *GalileoSky protocol: variable-length protocol, tag format.* 2. *EGTS (GOST R 54619-2011, the RF Ministry of Transportation order № 285)*
Accelerometer	*built-in*
Type of GLONASS receiver	*MGGS2217*
Coordinates determination accuracy, 95% of time, not worse	*5 m*
GSM modem	GSM 900/1800, GPRS *class* 10
2 SIM-cards support	*yes*
Voice menu	*yes (when using SD-card)*
Satellite modem	*Iridium*
Dampproofness	*no*

3 *Physical specifications*

Operating temperature range	*-40...+85 °C*
Storage temperature	*-40...+85 °C*
Relative humidity	*0...90% (0...35 °C); 0...70% (35...55 °C)*
Performance (height above the sea level)	*0-2000 m*
Storage	*0-10000 m*
Continuous work form battery	*depends on the Terminal settings, 8hrs on average*
External power supply	*9-39 V,* is protected against voltage jumps in the vehicle power supply
Dimensions	157,0 mm x 72,0 mm x 28,0 mm
Weight	*within 300g*
Body material	*Metal*

Warranty	*1 year since the purchase date;*
Average service life	*10 years*
Internal Li-Ion battery life	*500 charge/discharge cycles, two years maximum*

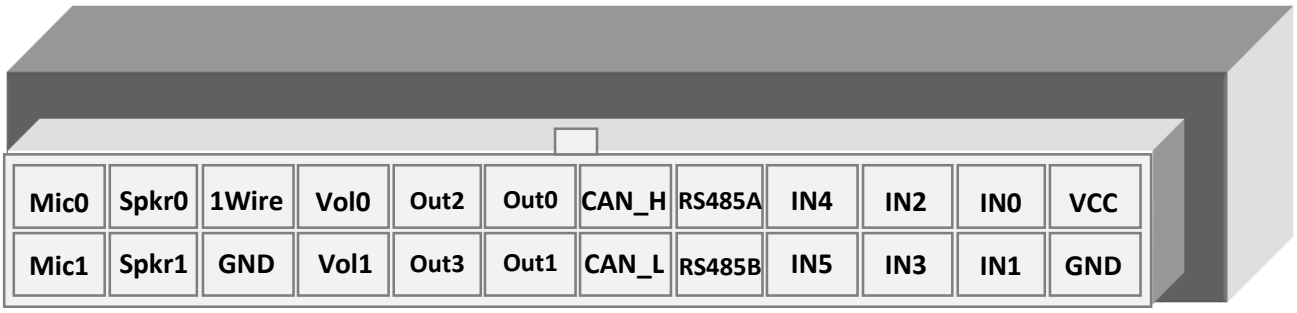
4 *Safe operating rules*

Before using the Terminal study the instructions of GSM, GPRS, Iridium devices safe operating.
Make sure the polarity is correct when connecting the terminal to the power supply.
The device should be connected straight to the vehicle battery, not to the vehicle power supply.
Caution! To avoid failure:

- **Connect the contacts correctly!**
- **Unused contacts must be well insulated!**

The ground is connected to the device body. In order not to damage the Terminal or the vehicle's electronics, it is necessary to separate the device body and the vehicle.

5 *Contacts description*



Contact	Description
VCC	Positive supply voltage
GND	Negative supply voltage
IN0	Zero analog-discrete input
IN1	First analog-discrete input
IN2	Second analog-discrete input
IN3	Third analog-discrete input
IN4	Fourth analog-discrete input
IN5	Fifth analog-discrete input
RS485A	A signal of RS485 channel
RS485B	B signal of RS485 channel
CAN_H	CAN interface CAN_H contact
CAN_L	CAN interface CAN_L contact
Out0	Zero transistor output (output 0/1)
Out1	First transistor output (output0/1)
Out2	Second transistor output (output0/1)
Out3	Third transistor output (output0/1)
Vol0	Zero contact to connect an external speaker for autoinformer function
Vol1	First contact to connect an external speaker for autoinformer function
1-Wire	1-Wire interface
GND	Ground to connect interfaces which need the ground contact
Spkr0	Zero contact to connect speaker of external headset
Spkr1	First contact to connect speaker of external headset
Mic0	Zero-contact to connect external headset microphone
Mic1	First contact to connect external headset microphone

6 Connecting

6.1 Connecting GLONASS aerial

Carefully screw the aerial to the Terminal, the upper side is above. To have a better view of the sky it is recommended that the aerial should be mounted on the vehicle roof, windscreen or under the dashboard.

If GLONASS aerial is mounted correctly, your coordinates will be found in 1.5 minutes. To be sure see that the green LED indicator is on. (section ***LED indicators)***.

6.2 Connecting GSM aerial

Carefully screw the aerial to the Terminal.
The aerial should be mounted in such a way so as to prevent the GSM signal from fading because of the vehicle body, for example, under the dashboard or outside the vehicle.

To make sure the GPRS modem is sending data see that the blue LED indicator is on. (section ***LED indicators)***.

6.3 Connecting Iridium aerial

Carefully screw the aerial to the Terminal, the upper side is above. To have a better view of the sky it is recommended that the aerial should be mounted on the vehicle roof, windscreen or under the dashboard.

6.4 Inserting SIM-card

Use a card with activated GPRS and SMS services.
Insert the card carefully ***without applying excessive force***.

1. To eject the SIM holder press the indicated place as shown in the picture with something sharp (needle, toothpick);
2. Insert the SIM-card so that it is completely hidden in the holder cover.

The second SIM-card should be inserted in a similar way.

6.5 Connecting power supply to the device

Positive supply voltage should be connected to contact VCC, negative supply voltage should be connected to GND. (Section ***Contacts description).*** If the connection is correct, the red LED will be on.

6.6 LED indicators

- **Red LED**

Is on when the power unit is connected to the Terminal.

- **Yellow LED**

Is on when the microcontroller is running (blinks with the frequency of 1 Hz).
It is also used to indicate the bootloader mode. (section LED indicators during reflashing)

- **Green LED**

Shows the GLONASS unit status.

Blinking frequency, times	Description
3	GLONASS unit is not found or is at the initialization stage
2	GLONASS unit is found but there are no correct coordinates
1	GLONASS unit works properly, coordinates are found and updated once a second

- **Blue LED**

Shows the GSM unit status.

Blinking frequency, times	Description
4	Stels mode (GSM unit is off and is set to be on according to schedule)
3	GSM unit is not found or is at the initialization stage
2	GSM unit is found but there is no server connection
1	GSM unit works properly, server is connected

7 Terminal units performance

7.1 Discrete-analog inputs (DAI)

To attach external sensors the Terminal has 6 discrete-analog inputs which are pulse-frequency at the same time. Each input's function is set in the Terminal settings (sections Discrete-analog inputs setting and Inputs/outputs). In Contacts description inputs are designated as IN0, IN1, IN2, IN3, IN4, IN5.
Each input saves its values to the nonvolatile memory, i.e. in case the channel is set to be a pulse one, the pulse number value will be restored after resetting the device.

Feature	Value
Maximum measured voltage	33 V
Analog inputs resolution	33mV
Maximum transmitted signal frequency	3,5 kHz (synchronous measuring at 1 input) 2 kHz (measuring at 2 inputs) 1 kHz (measuring at 6 inputs)

DAI has the following settings:

Parameter	***Explanation***
Filter type (input function)	0 - arithmetical average (also discrete input state is generated); 1 - pulse count; 2 - frequency input; 3 - pulse count from two synchronous connected sensors.
Filter length to calculate the mean value	The greater this parameter, the more slowly the device responds to the input signal change. With filter length equal to 1 - averaging does not happen. Set this parameter to 1 for frequency inputs. It is necessary to set this parameter to 1 for pulse inputs. If the Terminal counts extra pulses, the filter length should be increased by one and accuracy estimated.
Ranges for response/ nonresponse areas (logical 1 and 0)	To process discrete signals, discrete signal response/nonresponse range should be set where signals equal to one and zero. Discrete input statuses should be seen in the field Status Of Inputs, but not in the Input voltage. (Table 2. GalileoSky protocol tags). While counting pulses or frequency, it is necessary to put the value equal to half the pulse value into all the fields of the given group. (example: the pulses' amplitude is 5000 mV, so all the fields must take the value 2500 mV) While counting pulses from 2 synchronously connected sensors, response zone limits must be the same and equal to half of pulse value at response of one of the sensors. Non-response zone limits are equal to half of pulse value at two sensors simultaneous response.

7.1.1 Pulse count

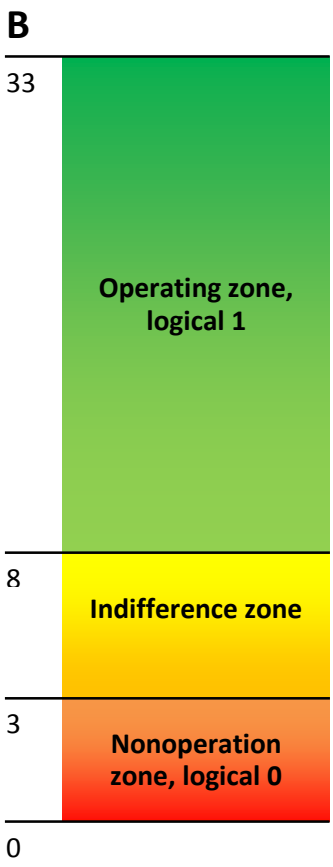
In case of a renewable counter the maximum pulse number can be 65535, after that the number is reset to zero.
If there is pulse at input, the correspondent bit will be set in Status of Inputs field, and a point will be recorded. If there is no another pulse for 30 seconds, the bit returns to 0.

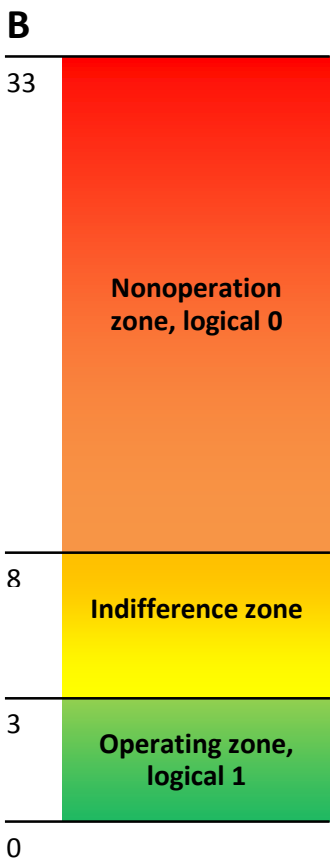
7.1.2 Mean value and discrete event generation

Let us consider the example with the following zero input setting (see the left-hand figure**):**

Filter type: 0;
Filter length: 5;
Logical one zone range is 8-33V;
Logical zero zone range is 0-3V.

The mean value is calculated continuously and is put into the corresponding field IN0.
At the same time, it is continuously checked whether the calculated value belongs to the given range.
If it is in the range 8-33V, the corresponding bit will find itself the Status of Inputs field and a point will be recorded.
At value coming into the indifference zone (3V-8V), the former bit value will be saved to the Status of Inputs field.
If the value is in the logical zero zone (0V-3V), the corresponding bit in the Status of Inputs field is reset.
Thus, we can see that the given bit changes its state only in the logical one/logical zero zone





Example2.
In contrast to example 1 (see the right-hand figure) the logical one zone and the logical zero zone have changed places.
In the same way it is possible to set zones of response and non-response for the Terminal`s power supply voltage (POWINCFG command, section Analog-discrete inputs setting). The state of discrete signal for input can be identified according to the 8th bit of the Status of the device field.

7.1.3 Frequency count

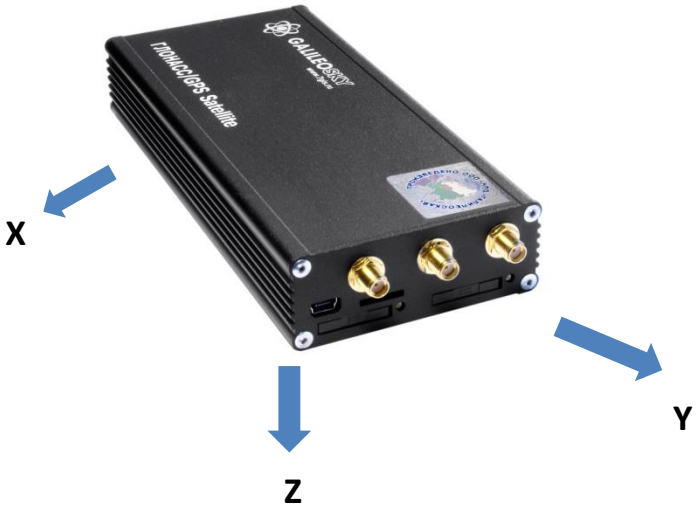
To measure frequency in some sensors it is necessary to connect the sensor frequency output to the sensor positive power supply via a 1kOhm resistor. Otherwise, frequency count is impossible.

7.1.4 Pulse count from two synchronously connected sensors

The Terminal allows connection of 2 pulse sensors on one input, in this case, pulse fronts number is count, i.e. for each sensor response counter value increases by 2. Connection circuit details are given in section Connection of ШЗ passengers flow registration sensors.

7.2 Determination of strike and incline

All devices can determine the Terminal strike and incline.
Accelerometer axis directions:



To determine strike:

1. Install the Terminal so as one of the accelerometer axis looks vertically, it will exclude false detections on road bumps;
2. Turn on strike and incline determination by SHOCK command (section Track parameters setting). For example, if Z axis is vertical: SHOCK 3,90,5,1200.

A strike is an acceleration increase in horizontal plane; the correspondent bit is put in the device state field (Table 3. Explanation of device state field) and strike coordinates are recorded.

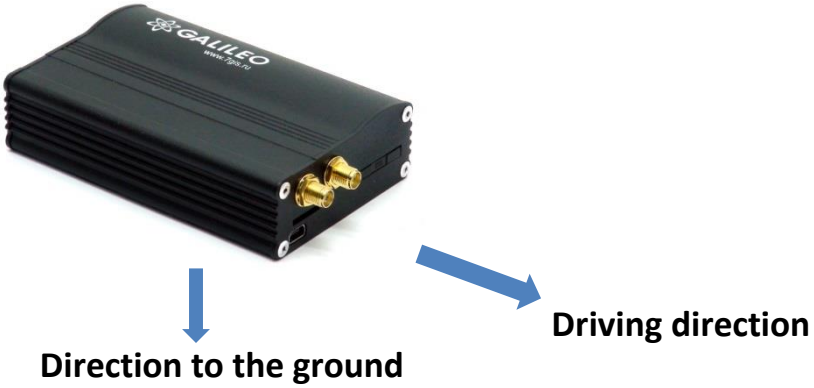
To determine incline:

1. Install the Terminal in vehicle;
2. By SHOCK command set maximum allowable incline angle and allowable time of this angle exceeding. For example, a maximum angle is 20º, allowable exceed time is 5 seconds: SHOCK 3,20,5,1200.

On the Terminal homing position change in a vehicle, SHOCK command should be given to adopt the Terminal to a new position.

7.3 Economical driving "EcoDrive" and determination of the driving style

The Terminal can detect rapid acceleration, braking, harsh turns and strikes on bumps. For correct operation of this function, the terminal must detect its orientation in space with respect to the vehicle (the vehicle´s running direction and the direction in respect to the ground). The driving style data are stored only if dynamic archive is enabled (FLASHARCHIVE 1 command).
The default orientation of the terminal:



If the terminal cannot be installed as illustrated by the picture, user-defined installation may be performed with the subsequent calibration of orientation.

To determine the position of the terminal in respect to the vehicle, perform the following steps:

1. Install the Terminal to ensure its rigid link with the vehicle's body;
2. Ensure the horizontal position of the vehicle;
3. Execute the shock 0 command, which will determine the direction of the terminal to the ground;
4. Start driving the vehicle at a speed exceeding 20 km/h; choose straight-line sections of the road while driving and keep performing acceleration and braking; in a few minutes the Terminal will perform determination of the running direction.

Data on the driving style can be sent out using the mainpackbit 174,1 command.

7.4 Data archiving to the external micro SD card

To create a backup on the external micro-SD card it is necessary to insert it into the Terminal. If the need arises, it can be ejected from the Terminal and the data can be read in a file manager or explorer with a card reader. It is also possible to send the archive to the server. CSV-files can be opened both with a text editor and Microsoft Excel. The saved data will be ordered in the following way:

MSD:\Track\

20100201.csv
20100202.csv
...
20100331.csv

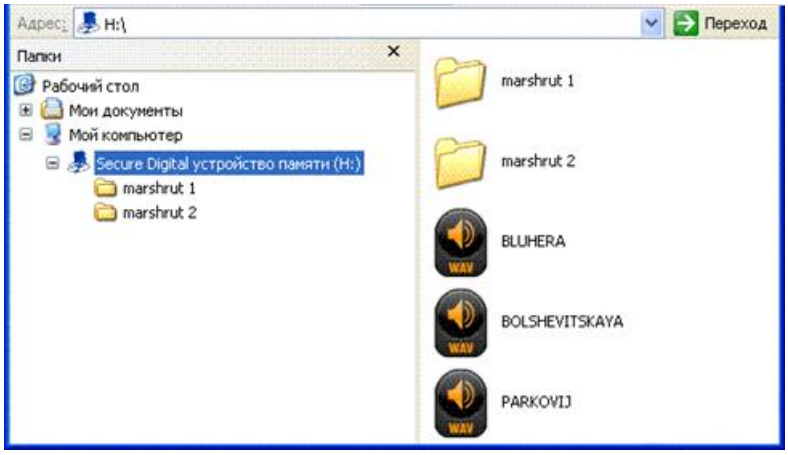
If there isn't enough space on the micro-SD card, the Terminal will delete the oldest files from the Track folder.

7.5 Autoinformer function

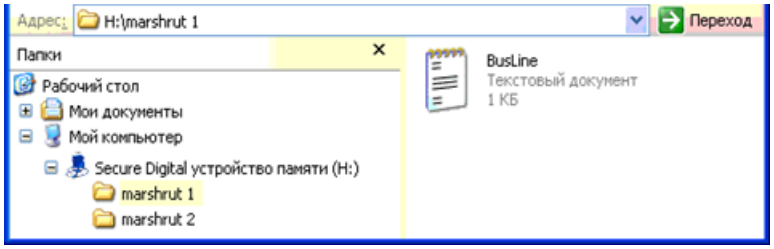
Autoinformer function may be used for automatic (without participation of the driver) public transport stops announcement with the use of a satellite navigation system.
The main difference from analogous systems is taking into account vehicle movement direction, thereby excluding false operation at other stops located in the same geographic area.

To use autoinformer it is necessary:

1. Attach the speaker to the Terminal (section Connecting autoinformer speaker).
2. Set the micro-SD card:
    a. Place sound files in format: wav, 16 kHz, mono, 16 bit to the card root folder. The file name must not exceed 20 symbols, including the extension, for example, PARKOVIJ.wav. The record length is recommended within 4 minutes (in case of exceeding, at the following file reproduction crackle may appear);
    b. Create folders with routes names in the card root folder. The smallest number of routes is 1.



    c. It is necessary to place the BusLine.txt file to the route folders, where response areas and areas linkage to the sound files are stored.



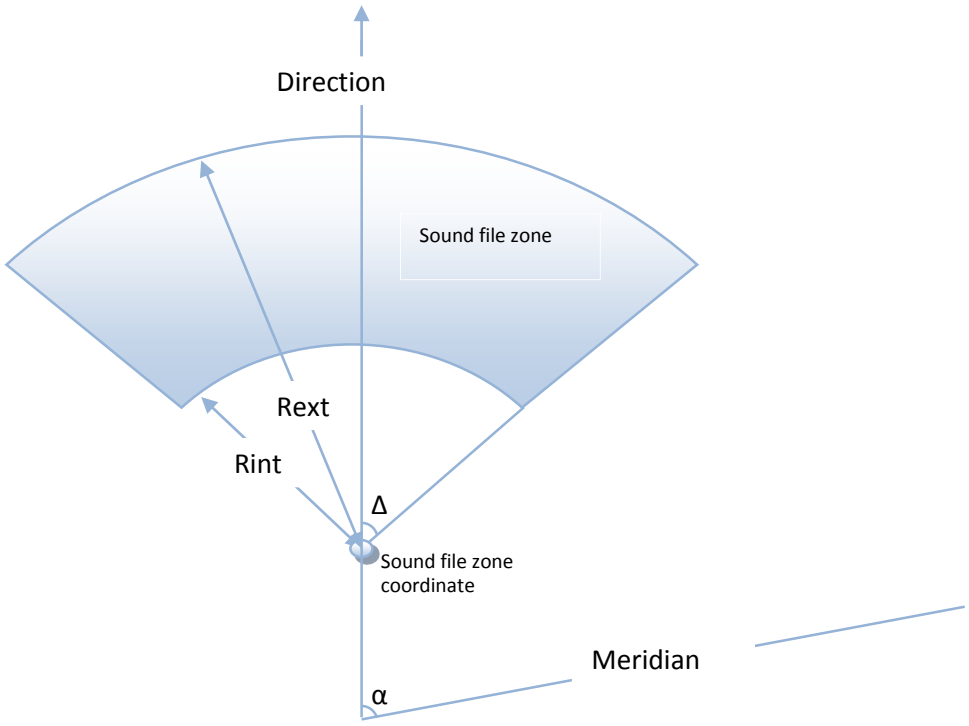
The format of one zone:

- Latitude;
- Longitude;
- Direction angle α (the angle between the meridian and a vehicle direction);
- Spread for the direction angle Δ (see the diagram below);
- Outer radius of Rext response zone;
- Inner radius of Rint response zone;
- Sound file name corresponding to this zone.

It is convenient to fill in the information for zones from Device tab of the Configurator while going along the route. By route forming it is necessary to indicate separate zones for stops in both directions even if the stops are opposite each other.

Latitude and longitude values are entered through the point "." (For example: 57.9842) where the value after point – is degree fractions. To transfer minutes into degree fractions (Xdegr.Ymin.) use the following expression Xdegr. = Ymin./60. For example: 57 degr. 55.4513min = 57.924188 degr.

Explanatory diagram



3. Activate the autoinformer function with the Autoinformer command. (section Autoinformer setting).
4. Insert a micro-SD card into the Terminal and reset it with the Reset command. After the Terminal resetting the function will be activated.

In the process of sound files playback there is a 5 seconds pause between adjacent files.

To test sound files:

1) Unscrew GLONASS aerial from the Terminal;
2) Enter into file BusLine.txt the following lines:
   [the following format: LAT,LON,ANGL,DELTA,RAD_EXT,RAD_INT,STRING_STATION]
   0.0;0.0;12.0;180;500;0;TEST.wav
3) Create *TEST.wav.* file in the micro-SD card root. This file will be played again and again after the Terminal resetting.

7.6 Signaling function

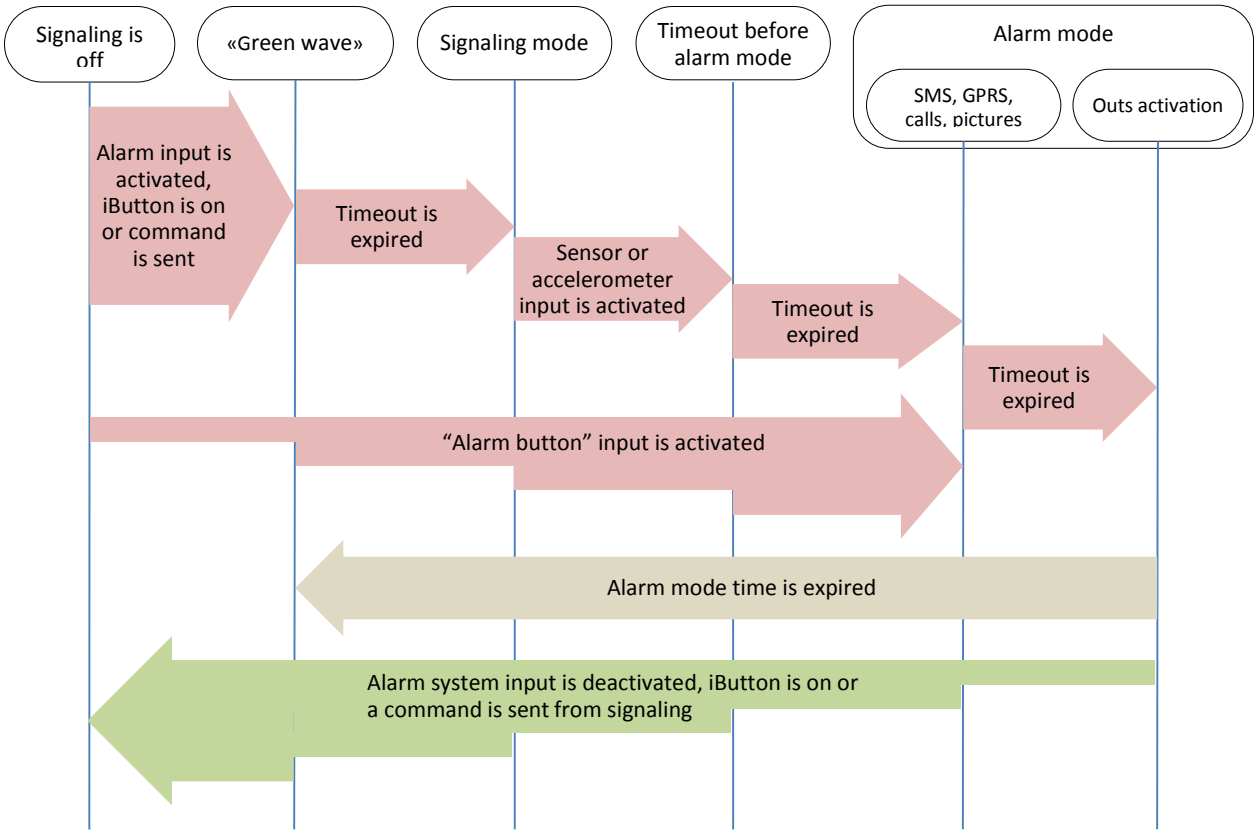
Signaling function allows assigning the response to:

1. analog input status change;
2. strikes and inclines (accelerometer data);
3. location change;
4. speeding;
5. iButton or RFID card connection.

The Terminal can react by inverting outputs status, sending an output pulse, sending SMS, making a preset number(s) telephone call, taking a picture or recording the point.

The settings that users can change are as follows (section Signaling mode setting):

1. the time when input signals are not processed ("green wave"), with signaling enabled;
2. the maximum time of alert mode after which the Terminal will automatically change into an alarm system mode;
3. the time between activation and change to the alert mode individual for each input;
4. an SMS text message when changing to the alert mode individual for each input;
5. the time between enabling the alert mode and status change individual for each input.



Alarm mode states change diagram

Alarm system activation and deactivation can be made by input, SMS or server message, using the iButton key previously programmed in the Terminal (section Digital inputs setting). Commands prevail over inputs states. Input activation depends on the settings given by the InCfg command (section Analog-discrete inputs setting), the level outputs are inverted with respect to is set by the Out command (section Transistor outputs setting).

7.7 Monitoring data transmission

Terminal allows specifying the list of preferred GSM-networks. The main priority is given to the networks from the beginning of the list. Every network is specified with country's code and network operator's code. Terminal supports up to 30 networks (OPS0 command, section Data transmission settings). If it's impossible to connect to one of the preferred GSM-networks, the Terminal connects to any network but doesn't establish connection to the server, thus voice communication and SMS will be available according to a tariff of the installed SIM-card.

The Terminal allows data transmission to the main and backup monitoring server via GSM. If there only transfer to the main server is set, continuous connection will be maintained. If there transfer to both servers is set, the Terminal is connected to the main server and then after the set period of time it breaks the communication and connects to the backup server and etc. The Terminal accounts transmitted data separately for each server, thus both will receive full archive with the track.
Using EGTS protocol, the Terminal number parameter (ID command, section Data transmission settings) specify the object number by the authentication.
Transmitted data may be coded; XTEA3 algorithm (http://tomstdenis.tripod.com/xtea.pdf). Commands, responses and photos are not coded. The data are archived in the internal flash-memory by default. During long periods without connection the oldest records of the internal flash-memory may be erased by the new ones. In this case, it is recommended to insert a micro-SD card and to adjust archive transmission from it (Archive command, section Service command).

7.8 Monitoring data transmission via Iridium satellite modem

The Terminal is equipped with Iridium satellite modem that allows the transfer of monitoring data outside of the coverage zone of GSM-networks. In this case, GalileoSky protocol and Iridium packet heads are used. Iridium satellite communication allows transferring data from any point on the surface of the Earth. The Terminal allows configuring the absence of GSM communication after which the Iridium modem will be automatically switched on (Sputnic command, section **Ошибка! Источник ссылки не найден.**). After switching on the satellite modem the Terminal will try to send current coordinates and the sensors readings within 10 minutes. Then the Terminal waits again for a predetermined time interval, if the GSM coverage is still missing, the terminal sends the packet again via the satellite modem. Data in the packet are formed in accordance with the settings of the main packet of GalileoSky protocol (MAINPACK command, section Server exchange protocol settings).

7.9 Internal Archive Structure

The data archive can be stored on the internal flash-memory or a micro-SD card. The internal flash memory card is used by default.
The Terminal stores the data from all the inputs and interfaces, even when they have no connected sensors, in the internal flash-memory archive. If it is unnecessary to store all the data, the dynamic archive can be used (FLASHARCHIVE command, section Service commands). In this case, only the data selected in configuration of the head and main packets will be saved (HEADPACK and MAINPACK commands, section Server exchange protocol settings). Any change of configuration of the head and main packets when the dynamic archive is on can cause flash-memory formatting and data loss. The use of dynamic archive can considerably increase the maximum number of kept points up to 58000.
By using the internal flash memory it is possible to choose the order in which points are sent to the server.
By default, the data are saved in the depth of the data store, i.e. current data are saved before older data. Transfer in chronological order can be set by FLASHARCHIVE command .After changing the direction of memorizing data the flash-memory will be formatted and all previously stored data will be lost.
By using a micro-SD card the data are always stored in chronological order. Note that only current data are used for the first packet.

7.10 Operation with two SIM-cards

The Terminal has 2 slots for installation of SIM-cards. Only one SIM-card can be active and support registration in GSM-network at the same time. Each SIM-card has its own APN. If a PIN code is used, it must be the same for both SIM-cards. The Terminal supports the following algorithm of SIM-card operation:

1. Only one SIM0 card is always active.
2. Automatic switching to the other card, if the data cannot be sent to the server within 9 minutes. Switching occurs in cycles, i.e. first SIM0 is used, then SIM1, and after this SIM0 again.
3. Switching between SIM-cards according to the list of preferred GSM-networks. If the terminal finds the availability of one of the specified GSM-networks, switching to the correspondent SIM-card occurs. If networks, specified for SIM0 and SIM1, are available at the same time, the preference is given to SIM0.

The second algorithm is always used for remote firmware updating; the Terminal attempts to get the connection to the server with firmware through SIM 0, and if it fails - through SIM 1.

7.11 GPRS traffic costs optimization

GPRS-traffic costs decrease by online monitoring may be reached by following these advices:

1. Turn off the transmission of unused data, for example temperature, acceleration, analog and digital inputs values, which have no connected sensors. It can be made in the Configurator on Settings/Protocol tab or by MainPack and HeadPack commands (section Server exchange protocol settings).
2. Increase points record period. It can be made in the Configurator on Settings/Track tab or by WrPeriod command (section Track parameters settings).
3. Increase turning angle at which the device records a point, and distance at exceed of which the point is recorded. It can be made in the Configurator on Settings/Tracks tab or by Turning command (section Track parameters settings).
4. Find out the time of disconnection because of the Terminal inactiveness from the server software developers. This parameter should be taken into account by points' record period setting otherwise the traffic will increase by reason of costs for restoring connection to the server. Example: points' record period at a stop is 1200 seconds (20 minutes), the server disconnection by reason of the terminal inactiveness is 180 seconds (3 minutes). The Terminal determines that a vehicle has stopped and switches on a timer for the next point record in 20 minutes, in 3 minutes the server disconnects as it hasn't received the data from the Terminal. The Terminal tries to reconnect the server at once. It happens 6 times and only in 20 minutes the Terminal sends the next point. As a result, traffic costs considerably exceed savings from points record interval increase.
5. Set filtering of coordinates at a stop so as the Terminal can correctly chose points' record period. The Terminal can determine a stop according to several elements:
   - accelerometer data (AccSens command, section Track parameters setting);
   - external supply voltage (MHours command, section Track parameters setting);
   - ignition sensor indications (Ignition command, section Track parameters setting).

If continuous online monitoring is not necessary, it is possible to set packet data transmission (section Stels mode and package transmission). In this case, the device will periodically contact, send the data from the blackbox and disconnect from the server. Savings are due to decrease of costs for one data packet transmission as when sending data from the archive a packet size may be up to 1000 byte, and by online monitoring usually one point is sent (a few tens of bytes). At the same time, the Terminal operation from the battery increases as during server disconnection periods the device switches off GSM-unit.

7.12 Operation in international roaming

The Terminal allows setting special parameters of data transmission in the international roaming (Roaming command, section Data transmission settings). After registration in GSM-network the Terminal receives code of the country and code of the operator from base station and compares them with the set ones, if they do not match, the Terminal is in roaming. You may specify only code of the country (international roaming) or code of the country and code of the operator (national roaming). Being in roaming the Terminal constantly supports registration in GSM-network but initializes GPRS-session only according to the schedule, thus it is always possible to make a call to the terminal or send SMS with a command and decrease GPRS-traffic costs. For GPRS-session the maximum volume of transmitted data in bytes is determined. Each cellular operator has minimum tariffing interval in roaming, it is recommended to set maximum data volume equal to half of this interval (the second half is for official traffic TCP/IP the volume of which depends on connection quality). By archive transmission from internal flash-memory, the Terminal always unloads the data in accordance with the archive settings (FLASHARCHIVE command, section Service commands). By archive transmission from microSD-card it is recommended to set coordinates transmission and sensors indications in the first packet, thus the Terminal sends one point with a current vehicle coordinate and the oldest unloaded archive part. The data from the SD-card are unloaded in chronological order.

7.13 Stels mode and packet transmission

In this mode the Terminal switches off GSM- unit and contacts only according to a strict schedule, which allows decreasing the Internet traffic and power consumption.

Stels mode settings command: *stels pday,phours,minGSMon*, where

- *pday* – Terminal contact is enabled every *p days* since the beginning of the month, in other words on days, multiple to *pday*;
- *phours* – device contact is enabled every *p hours* since midnight GMT, in other words at hours, multiple to phours.
- *minGSMon* – GSM unit is enabled for *minGSMon minutes since the beginning of the hour*.

Packet transmission can also be set in the Configurator on Settings/Data transmission tab.

To disable these modes use the stels0,0,0 command.

Setting examples:

1) – contact once a day;
   – contact at 14.00 GMT;
   – staying in network for 15 minutes.
   Setting command: stels 1,14,15
   To enable the Terminal contact once a day phours must be greater than 11, i.e. it can be enabled at 11 and at 22 o'clock. If it is set to contact every 12 hours, the contact will be enabled at 12.00 and the next one must be at 24.00, but this is another day, i.e. it is not realized.
   - contact once a day;
2) – contact every 2 hours GMT;
   – staying in network for 15 minutes.
   Setting command: stels 1,2,15
3) – contact once in three days;
   – contact at 23.00 GMT;
   – staying in network for 15 minutes.
   Setting command: stels 3,23,15

Note:

- contact at 0 o'clock GMT cannot be enabled whatever the settings are;
- remote commands will work only when the Terminal radio silence mode is disabled, i.e. GSM unit is on;
- do not set the contact time less than five minutes, otherwise, the Terminal will not have enough time to establish a link with the server and to report about its location.

7.14 Geofences

The Terminal allows setting areas where coordinates are not updated, the GSM-unit is switched off. It is also possible to set periodical camera shooting (PhotoCfg command, section Digital inputs settings). Each area is described by the coordinates of the center and by the radius. Geofences' setting commands are given in section Track parameters setting.

7.15 Power saving

To reduce power consumption of the Terminal in the operating mode, perform the following steps:

1. For RS232 port, execute RS2320 0 command or specify peripheral type as "nothing" in the Configurator.
2. Turn off the integrated CAN-controller if the Terminal is not connected to a CAN-bus. This can be performed by using CANREGIME command with the first parameter set to 0, or by specifying "CAN disabled" as the Filter type in the Configurator.
3. Turn off the Autoinformer when it is not used. This can be done by sending AUTOINFORMER command with the first parameter set to 0, or by unticking the "Autoinformer" section of the Configurator.
4. Reduce the degree of track details. The lower this degree, the less the power consumption.

To reduce power consumption of the Terminal at a stop, perform the following steps:

1. Set up the shutdown of the GPS/GLONASS unit at a stop, this can be performed by using SLEEPMODE command (section Service commands) or on the Power saving tab in the Configurator.
2. Enable the deep sleep mode at a stop. The deep sleep mode is turned on at the end of a pre-specified time period at a stop. In this mode the Terminal disables the specified modules (GPRS, CAN, RS232, RS485, micro-SD), reduces the ADC sampling rate, does not sample 1Wire sensors and does not charge the battery. The behaviour in the deep sleep mode can be configured by using SLEEPMODE command (section Service commands) or on the Power saving tab of the Configurator. It is possible to setup a period of connection to a server in the deep sleep mode.

7.16 Remote configuration

Remote configuration can be performed through several data transfer channels:

1. SMS. The Terminal has a list of 4 authorized phone numbers, the messages from which are treated as configuration commands. The available commands are described in the section Settings for SMS control. A phone number can be added to the list of authorized numbers either through the Configurator, or by sending a message with AddPhone command (section Settings for SMS control).
2. GPRS. Commands can be sent from the monitoring data processing server. The format of the commands is described in the section Server exchange protocol.
3. GPRS. For devices with the SIM900 or SIM900R GSM-unit commands can be sent via the Configurator and the remote configuration server of GalileoSky Ltd. In this case, the Terminal supports two parallel connections: the first – with the monitoring data processing server, and the second – with the remote configuration server. Remote configuration can be enabled using RemoteConfig 1 command (section Service commands). It is possible to send commands to the Terminal, to receive current information from the sensors connected and to receive diagnostic messages, when working with the remote configuration server. Using the Configurator it is possible to create a command pack to configure the Terminal and to save it on the server. These commands will be sent to the Terminal when it establishes the connection to the server.

8 *Connecting external peripheral*

8.1 CAN-interface

The Terminal allows extracting information from the CAN-bus.
The following protocols are supported:

– J1939 (FMS). According to this protocol, the Terminal is not a device transmitting to CAN-bus, the device does not change vehicle operation, it also doesn't send confirmations to vehicle units packets and there is no electrical noise in the CAN-bus. In some cases, by connection to the troubleshooting socket for correct reading of information from the bus it is necessary to send confirmations to vehicle units packets, for this give ActiveCAN 1 command to the Terminal (section CAN settings).
– J1979 (OBD II). This protocol works according to the question-answer mode, consequently the Terminal transmits the data to the CAN-bus.

Available performance modes:

J1939_SCANER – the bus scanner sending bus reports to the configurator.
FMS – a standard FMS protocol filter. (see www.bus-fms-standard.com).
J1939_USER_29bit – a configurable user filter. Identifier length is 29 bits.
J1939_USER_11bit – a configurable user filter. Identifier length is 11 bits.
J19379_SCANER – *the* bus scanner defining bus speed and identifier capacity.
J1979 _29bit – a standard J1979 protocol filter for 29 bits identifiers.
J1979 _11bit – a standard J1979 protocol filter for 11 bits identifiers.

8.1.1 J1939_SCANER mode

This mode is intended to study CAN bus reports, according to J1939 protocol.
Bit rates from 10000 bit/s up to 500000 bit/s (typical values: 62500, 12500, 250000, 500000) are supported.
11 and 29 bit identifiers are supported.
The scanning mode works as follows:

1. The «**CAN. Start scan.»** message is displayed;
2. The CAN-bus reports are displayed with a delay indicated by the CAN Regime command. (section CAN settings).

29bit identifiers are displayed in the following format:

ID=00000009 (8) 06 07 08 09 00 CC DD EE
where
ID – is a 29bit message identifier;
(8) – is the number of received bus bytes.
06 07 08 09 00 CC DD EE – is an 8byte message. (The lower byte is on the left, the higher byte is on the right),

11bit identifiers are displayed as:

ID=009 (8) 06 07 08 09 00 CC DD EE
where
ID – is an 11bit message identifier;
(8) – is the number of received bus bytes;
06 07 08 09 00 CC DD EE – is an 8byte message. (The lower byte is on the left, the higher byte is on the right).

3. After all the identifiers have been displayed you can see the **CAN. End scan.** message.

To enable this mode:

1) Connect the Terminal to the vehicle CAN interface;
2) In the Configurator on Settings/CAN tab select bus rate and delay time (time of message waiting time);
3) Press Start Scanning J1939. Received data are displayed in the right panel.

8.1.2 FMS mode

This mode is included in all Terminals by default; it allows retrieving and decoding messages relevant to FMS protocol:

- total fuel consumption: the amount of fuel the vehicle had used since it was made;
- tank fuel level: measured in percent. 0%-empty, 100%- full;
- coolant temperature;
- engine speed;
- total mileage;
- operating hours;
- axis load.

Attention! Many car manufacturers support FMS protocol partially or do not support it at all.
To enable this mode:

1) connect the Terminal to the vehicle's CAN interface;
2) give the CanRegime 2,250000,2000 command (section CAN settings) or select FMS filter type in the Configurator on Settings/CAN tab;
3) make sure the device receives bus data and sends them to Device tab in the Configurator;
4) set the right data transmission to the server using the MainPack command (section Server exchange protocol settings) or in the Configurator on Settings/Protocol tab.

8.1.3 J1939_USER_29bit mode

This mode enables us to receive 29bit identifiers (ID) messages from the vehicle CAN-bus, according to J1939 protocol.

To enable this mode:

1) connect the Terminal to the vehicle's CAN interface;
2) select Custom filter (29bit identifiers)type in the Configurator on Settings/CAN tab, set the bus rate and delay time or give CanRegime command with necessary parameters (section CAN settings);
3) set filers for CAN-bus messages.
4) set sending of received data to the server with the help of MainPack command (section Server exchange protocol settings) or in the Configurator on Settings/Protocol tab.

Notes:

1) In protocol of the first and the main packet of the Terminal (Table 2. GalileoSky protocol tags) there are 1-byte, 2-bytes and 4-bytes tags for this mode operation, i.e. if the necessary ID needs only one byte from all data, better choose 1-byte tag.
2) Any of these tags can correspond to the right CAN message ID
   Attention! The data should be recorded in the decimal system in the Terminal. The hexadecimal notation is used for convenience only.

By means of shifting it is possible to choose exactly that part of bytes, which should be filled in the tag from the useful information received with this ID.

Let us see an example:

The CAN message identifier is ID=0x18F00300.
We need only the first byte of all the sent content with this ID.
As we need only one byte, we shall choose the tag CAN_R0 as an example.
The command to set the tag is as follows: CAN8BITR0 ID,Shift.

1) The tag number ID=0x18FEEE00 will look as 419360256 in the decimal system.
2) The byte we need is shifted by one byte that is the second parameter is equal to 1.

So we have the following command to set the filter CAN8BITR0 419360256,1.
Now when the message in question is passing through the bus, the first effective load byte will automatically be placed to the tag R0 and sent to the server.
These settings are easier to make in the Configurator:

1) Scan the bus;
2) Indicate identifier in the first column;
3) Select correspondent tag;

4) Visually indicate the shift using a mouse. The number transmitted to the server will be displayed in the Value Column.

J1939_USER_11bit mode is set similarly.

8.1.4 J1979_SCANER mode

This mode is used to define data transfer rate and Identifier length according to J1979 protocol. If the parameters of transfer are known, it is recommended to use the J1979_29bit and J1979_11bit modes, having specified necessary rate of the bus.
The rate of 250000 bits per second and 500000 bits per second and 11 and 29 bit identifiers are supported.
To enable this mode:

1) connect the Terminal to the vehicle's CAN interface;
2) press "Test OBD II". Received data are displayed in the right panel.
3) If scanning finished successfully, data transfer rate and Identifier length will be set automatically.

Attention! Scanning according to J1979 protocol can cause failures in on-board equipment operation. GalileoSky Ltd bears no responsibility for any failures after CAN-bus scanning.

8.1.5 J1979_29bit mode

This mode allows extracting and decoding the messages with 29 bit identifiers, transferred according to J1979 protocol automatically:

- tank fuel level: measured in percent. 0%-empty, 100%- full;
- coolant temperature;
- engine speed ;
- errors codes.

Attention! Many car manufacturers support J1979 partially or do not support it at all.
To enable this mode:

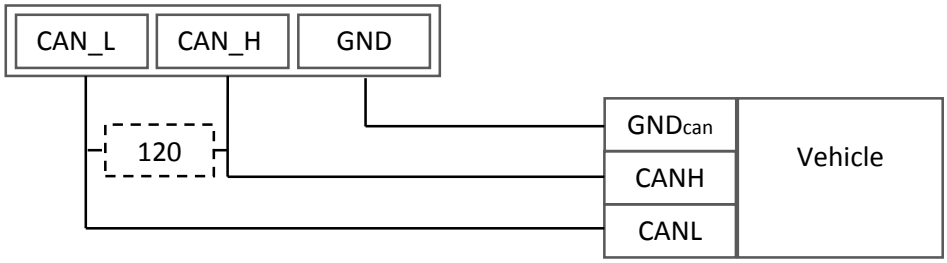
1) connect the Terminal to the vehicle's CAN interface;
2) give the CanRegime command (section CAN settings) or select OBD II 29bit filter type in the Configurator on Settings/CAN tab;
3) make sure the device receives bus data and sends them to Device tab in the Configurator;
4) set the right data transmission to the server using the MainPack command (section Server exchange protocol settings) or in the Configurator on Settings/Protocol tab.

J1979_ 11bit mode is set in a similar way.

Attention! If your vehicle doesn't support J1939 protocol, **J1979_29bit** and **J1979_11bit** modes operation can cause failures of board equipment operation. GalileoSky Ltd bears no responsibility for failures after activation of these modes.

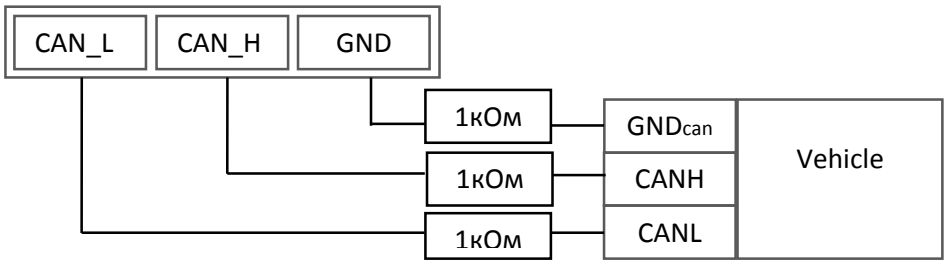
8.1.6 Variants of connection to the CAN-bus

1. Direct connection.



Attention! If the terminating resistor (is shown with a dotted line in the diagram) is not installed on the vehicle side, it should be installed. Its presence can be checked with the help of a multimeter: it is necessary to measure the resistance between CAN_H and CAN_L when the vehicle electronics is off. If the resistance is about 60 Ohm, there is no need for a terminating resistor. If the resistance is 120 Ohm, it is necessary to connect a standard 120 Ohm resistor between the CAN_H and CAN_L wires.

2. Connection with current-limiting resistors

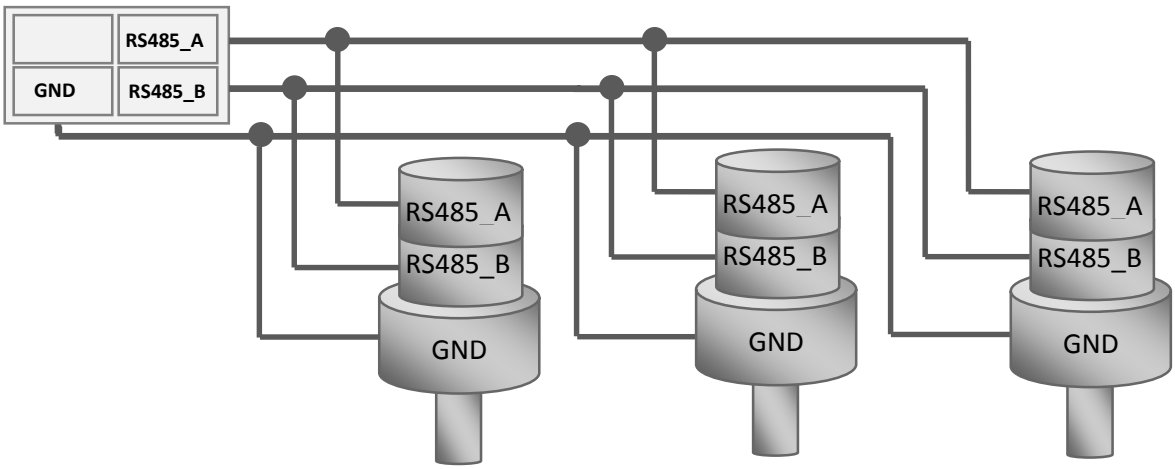


To plug the Terminal into the troubleshooting socket it is necessary to use the first connection variant.
Only the second variant is recommended for use to connect the Terminal directly to the vehicle's CAN bus.

8.2 Connecting digital fuel sensors using (RS485) protocol

The order of connection:

1. Connect RS485_A, RS485_B, GND sensor contacts to Terminal RS485_A, RS485_B, GND contacts (section Contacts description).
   The sensor power supply is provided separately.



2. Set transfer of received data to the server by MAINPACK command (section Server exchange protocol settings) or in the Configurator on Settings/Protocol tab. These data transmission is on by default.
3. Make sure that the Terminal receives data from the sensor. It can be done in the Configurator on Device tab.

The Terminal can support up to 16 sensors at a time. The sensors should have addresses 0, 1, 2, …, 15 correspondingly. If the Terminal receives no messages from the sensor within 18 seconds, the RS485 field value will be set to zero. In this way it is possible to detect sensor disconnection or failure. Values from sensors with the addresses from 4 to 15 and temperature data from sensors with the addresses from 0 to 15 are stored in the memory only by archive dynamic structure activation (FlashArchive command, section Service commands).

8.3 Connecting GalileoSky photo camera to the device

Camera technical specifications:
- Power supply: 10-30V.
- Average power consumption in standby mode: 0.17W.
- Average power consumption in shooting mode: 0.53W.
- Operating temperature range: -30…+60ºC.
- Body material: plastic.
- Turn on time: less than 2sec.
- Camera mode announcement
- Dimensions: 54,0x38,0x21,0 mm.
- Interface of data transmission: RS485.

Optical characteristics:
- Focal distance: 4mm.
- Angle of view: 64 degrees.
- Distortion: 0,38%.
- Infrared filter: yes.
- Manual focusing: yes.
- Matrix diagonal: ¼".

Picture characteristics:
- Colour depth: 24bit.
- Picture format: JPEG.
- Picture resolution: 640x480 and 320x240.

- Picture size: 6-65kB.
- Average picture size: 25kB
- Time of one picture receiving: 2-10s.
- Time of transmission to the server: more than 1 minute (depends on the picture size and GSM connection quality).

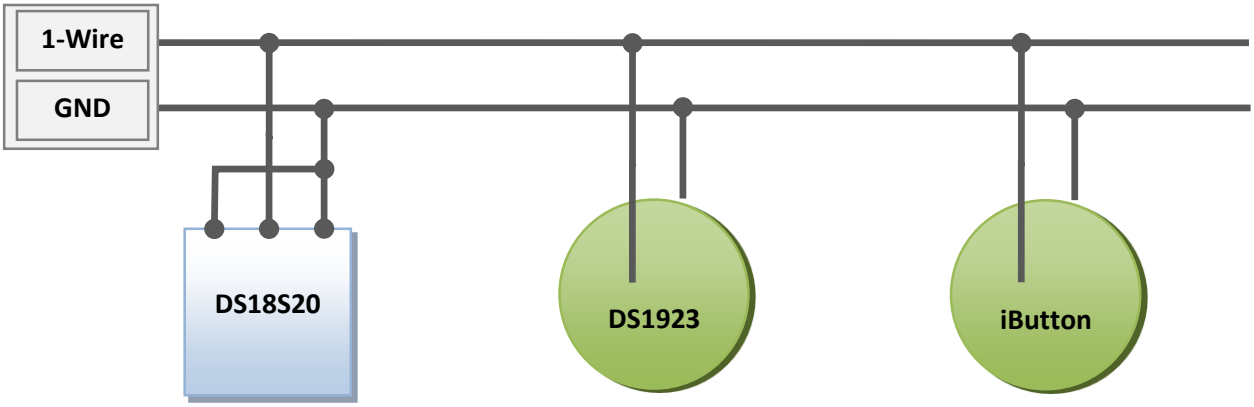
Wires colour codes:
-brown: +10/30V
-black: GND
-blue: RS485_A
-white: RS485_B

The order of connection:

1. Connect the RS485_A, RS485_B, GND camera contacts and the RS485_A, RS485_B, GND Terminal contacts correspondingly (section Contacts description).
   Attention! The Terminal and the camera grounds should be connected!
   Camera has separate power supply.
2. Insert a microSD card into the Terminal slot.
3. Make the right settings of RS485 Terminal port for operation with cameras and fuel sensors, use RS485FN 2 command (section Digital inputs settings) or the Configurator on Settings\Digital inputs tab.
4. Reset the Terminal.
5. Make sure that the Terminal operates correctly with the camera. For this, give the makephoto 2 command in the Configurator and, after switching to the Troubleshooting tab, tick RS485. When the Terminal receives a picture from the camera, the Troubleshooting will display RS485[0].cam. rx pic. message. Green LED on the camera blinks rarely in standby mode and quickly during picture transfer.
6. Evaluate the quality of the picture in the Configurator, or eject the microSD card from the Terminal and connect it to PC. Pictures from the camera are saved in the catalogue Pic\RS4850. A separate catalogue is created for each date; file names reflect the time when the shots were taken.
7. Reinsert the microSD card.

8.4 Connecting 1Wire sensors

It is possible to connect different sensors working through 1-Wire interface, and they can operate simultaneously.



8.4.1 Connecting iButton (DS1990, DS1982) identification key

There are several identification key (IK) applications:

- driver identification;
- trailer turning off identification;
- doors opening identification.

In the same way it is possible to connect devices emulating iButton, for example, RFID-codes readers.

The Terminal can support up to 8 identification keys with certain identifiers or two identification keys with any identifier. When using a micro-SD card up to 1000 IK with certain identifier are supported.
By identification key applying to 1-Wire and GND contacts (Contacts description) the key number is entered into the memory, the point is recorded and four lower bytes are sent to the server without checksum. By key disconnection the number turns to zero, the point is recorded and message is sent to the server. Keys having code less than 100000 are stored in iButton[1] field.
There can be set up to eight key identifiers using iButtons command (section Digital inputs settings) or in the Configurator on Settings\Digital inputs tab. You should enter the 4 Lower bytes of iButton key number without checksum, in hexadecimal system.
For example, full hexadecimal key number:

09 00 00 00 91 02 0C 5C, where
09 – type of device (in this case, it is DS1982, for DS1990 is 01),
00 00 00 91 02 0C – unique number,
5C – checksum.

In this case, one should enter 00 91 02 0C.
By identification key applying with one of the certain identifiers, a correspondent bit will be set in iButton connection status field. You may control it on the Device tab in the Configurator.
When using a micro-SD card, you may edit a list of trusted keys with the help of the AddKey, DelKey commands (section Digital inputs settings). You can also connect the card to the computer and edit the list in the Configurator on the Trusted iButton keys tab. In case of connection of one of the enlisted IK, a correspondent bit will be set in the Device Status field. (Table 3. Explanation of the device status field).

8.4.2 Connecting DS18S20 (DS1820, DS18B20) thermometers and DS1923 temperature and humidity sensors

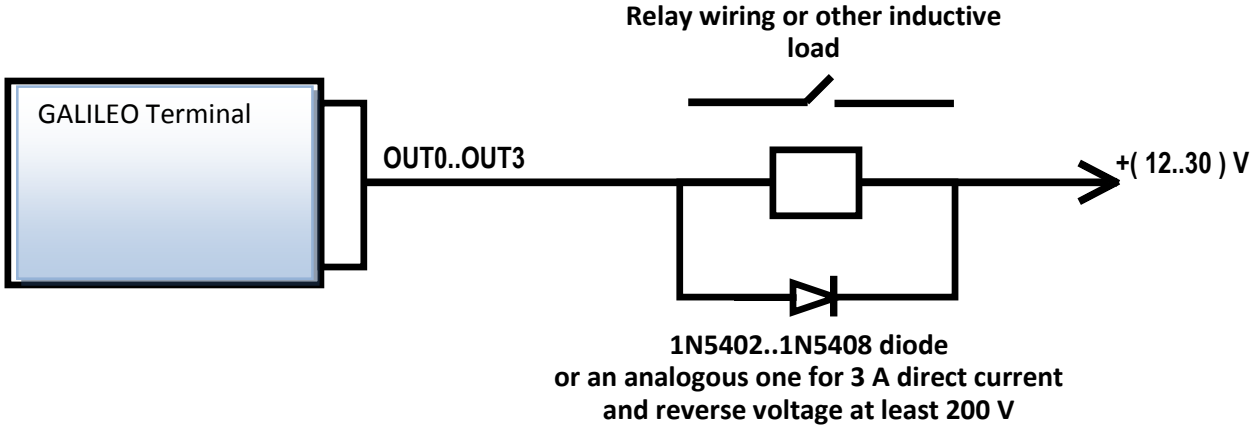
It is possible to connect up to 8 DS18S20 thermometers and 8 DS1923 sensors. To use the sensors connect them to 1-Wire and GND contacts (Contacts description) and activate the corresponding protocol items (Server exchange protocol settings, Table 2. GalileoSky protocol tags). There is no any linkage between a thermometer or humidity sensor and a certain tag cell in the protocol. All data are stored in memory cells in a definite order: from a lower tag to a higher tag. If the number of cells exceeds the number of thermometers, the extra higher cells will contain the data, which correspond to disconnected sensor state.
By temperature sensor turning off the thermometer field shows disconnection (-128ºC).
By humidity sensor turning off the thermometer field shows disconnection (0%).

8.5 Connecting Autoinformer speaker

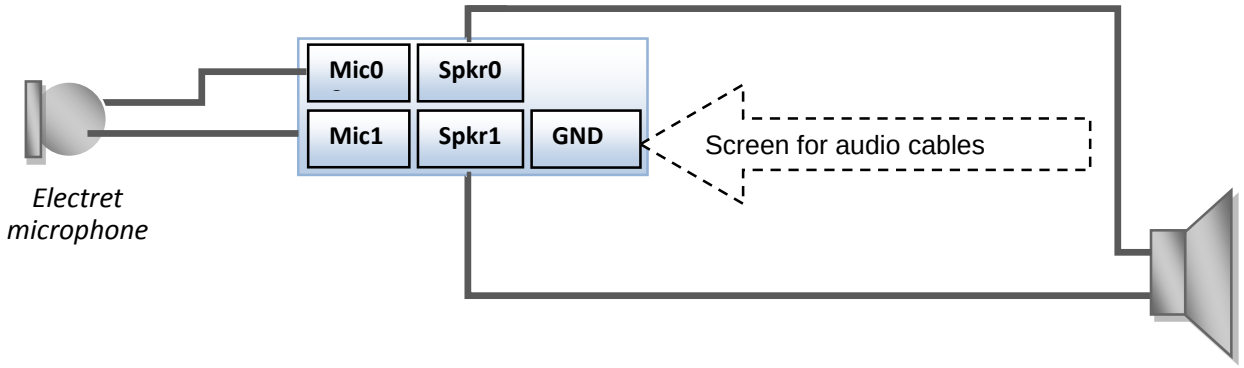
Speaker
Not less than 8 Ohm

8.6 Transistor outputs (0/1)

To operate external devices there are 4 discrete «open collector» outputs (section Contacts description) in the Terminal. The maximum output voltage is -+30V, each output current is no more than 80mA.
The Terminal outputs values are stored in the nonvolatile memory, so the device sets these stored values even after being reset.
To operate outputs use Out command (section Transistor output settings) or the Settings/Inputs/Outputs tab in the Configurator*.*
OUT0…OUT3 outputs relay connection circuit



8.7 Connecting audio equipment



Microphone specifications

Parameter	Min. value	Mean value	Max. value
Operating voltage, V		1.60	2.2
Operating current, microampere	70		300
Load resistance, kOhm	1.2	2.2	

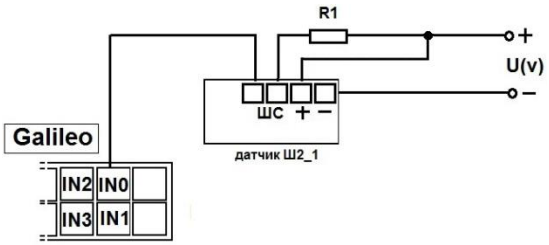
Speaker specifications

Parameter	Min. value	Mean value	Max. value
Connected speaker resistance, Ohm	8		
Operating current, mA			+-250
Power with a 32Ohm speaker, mW		250	

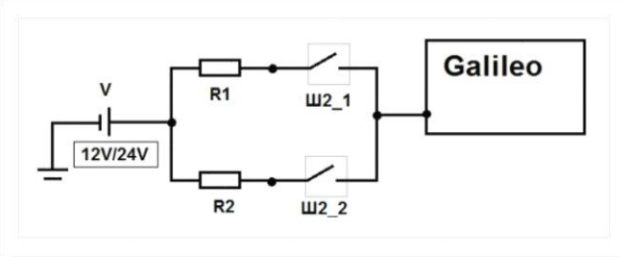
8.8 Connecting Ш2 passenger flow registration sensors

The Terminal supports connection of up to 16 Ш2 sensors through 8 discrete-analog inputs (DAI) IN0-IN7 (Contacts description).

Connection order of one Ш2 sensor through resistor to one of DAI of the Terminal.

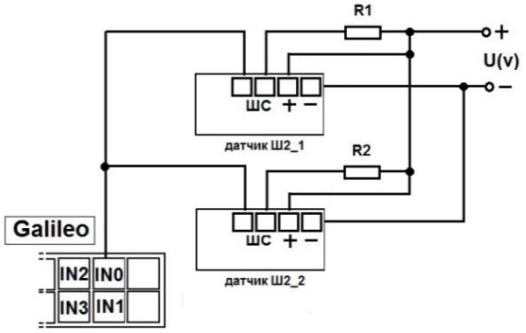


To connect 2 Ш2 sensors to one of DAI use divisor on two resistors. Calculation principle is realized on voltage level change by sensors triggering.



V – Power supply (battery/ vehicle power supply);
R1, R2 – resistors;

Ш2_1, Ш2_2 – Ш2- passenger flow registration sensors.



Connection order of 2 Ш2 sensors through resistors to one of DAI of the Terminal.

To set an input to count pulses from two sensors one may in the Configurator or by **incfg0 3,2,X,X,Y,Y** command (where Y – one sensor triggered; X – two sensors triggered).
Parameter **X** and **Y** depending on supply voltage and **R1, R2** resistors resistance assumes different values, for example:

U(v)=12, R1=10k, R2=10k, тогда X=3500, Y=7921
U(v)=12, R1=14k, R2=14k, тогда X=3000, Y=7000
U(v)=24, R1=10k, R2=10k, тогда X=7000, Y=15842
U(v)=24, R1=14k, R2=14k, тогда X=6000, Y=14000

It is calculated according to the formula:

$$X = \left(\frac{7 * U}{14 + R1 * 0.001}\right) * 1000; \qquad Y = \left(\frac{14 * U}{28 + R1 * 0.001} + \frac{7}{14 + R1 * 0.001}\right) * 1000;$$

Attention! To avoid false operation by sensors connection and further operation of sensors use stable voltage power supply.
Terminal operation result will be pulse fronts count from each sensor, i.e. when one person passes through one door, total pulse number increases by 2. Correspondingly, to count passengers number passed through the sensors divide pulse count result by 2.

8.9 Connecting Matrix 5 RFID-codes reader using RS485 interface

The order of Matrix5 connection:

1. Connect the RS485A, RS485B, GND contacts of the Terminal and the RS485A, RS485B, GND of the Matrix5 correspondingly.
2. Configure the RS485 port in the Terminal to operate with the reader. It can be done by the RS485FN 1 command or in the Configurator on Settings\Digital inputs tab.
3. Reset the Terminal.

The keys received from Matrix5 are stored in iButton[1] field.

8.10 Connecting ДБГ-С11Д dosimeter using RS485 interface

ДБГ-С11Д dosimeter is intended for continuous measuring ambient equivalent dose rate (ADER). The Terminal enables to receive the current ADER readings in 3V/h and data about dosimeter state. Then this information will be sent to the server. One dosimeter operation is supported. The dosimeter can be connected simultaneously with fuel sensors and GalileoSky photo camera.
The order of ДБГ-С11Д dosimeter connection:

1. Connect the RS485A, RS485B, GND contacts of the Terminal and the RS485A (contact 1), RS485B (contacts 2), GND (contact 6) of the dosimeter correspondingly. Dosimeter has separate power supply.
2. Configure the RS485 port in the Terminal to operate with fuel sensors, photo cameras and dosimeter. It can be done by the RS485FN 2 command or in the Configurator on Settings\Digital inputs tab.
3. Specify dosimeter data in the transmission protocol to the server. If dosimeter data sending is off, the Terminal will not sample ДБГ-С11Д.
4. Turn on the Terminal`s archive dynamic structure. Dosimeter data are not stored in the archive by using the static structure.
5. Reset the Terminal.

9 *Configurator*

Configurator is a PC program, which allows:

- configuring the Terminal via graphic interface and with the help of commands;
- troubleshooting the Terminal saving the results in a log-file;
- seeing the Terminal units state in real time mode;
- downloading monitoring data from the internal memory and a SD card;
- sending the downloaded data to the server;
- specifying areas for autoinformer.

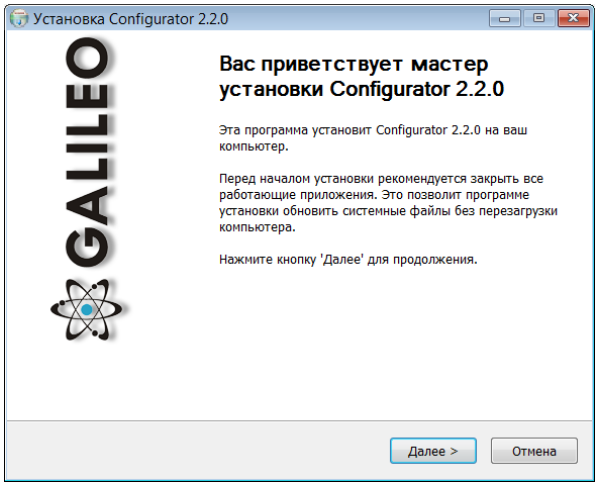
32 and 64 bit OS are supported: Windows 2000, Windows XP, Windows Vista, Windows 7.

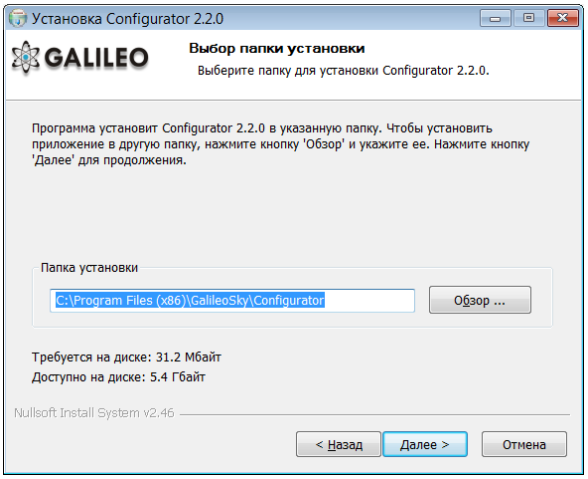
9.1 Program installation and running

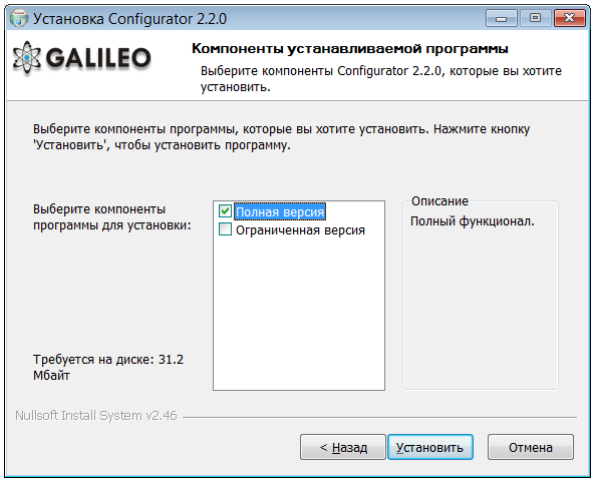
Download the Configurator program from the site and launch it.

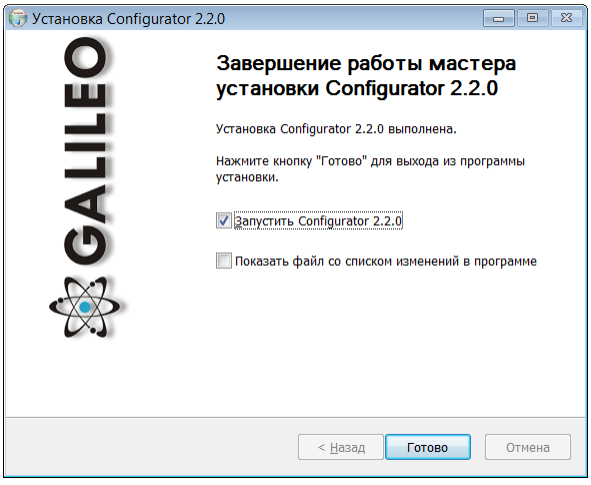
Attention! Program installation may require changes of crucial OS elements. Do not let your antivirus program block the installer operation.

In case of a security system warning, confirm launching the program.









During the installation old drivers will be deleted and new ones will be installed. It is possible to install the major version of the Configurator or a limited one. The latter one allows uploading archive and receiving the current parameters of sensors, but not changing the settings.

Start the Configurator program (Start menu\Programs\GalileoSky\Configurator). Turn on the power of the Terminal and connect it to the computer via a USB cable.

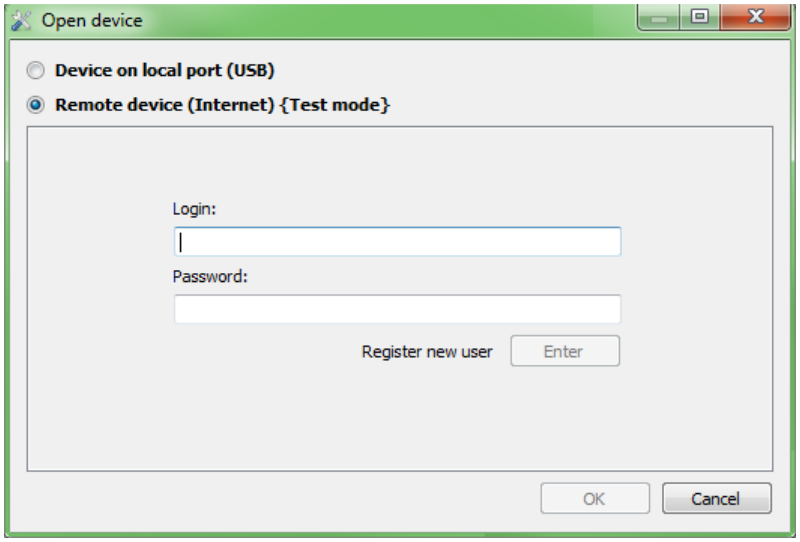
After the Terminal connection the program loads all the device settings parameters automatically. If the program identifies the Terminal, all the buttons on the vertical left-hand panel will be active.

9.2 Device tab

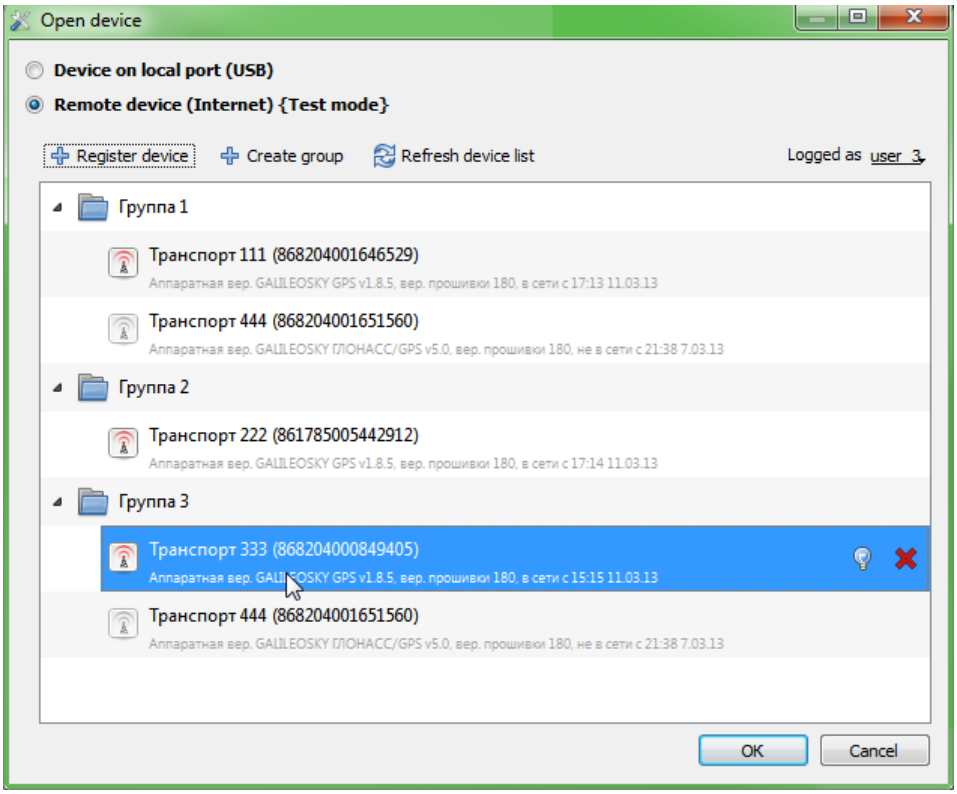
The tab displays the information about the Terminal state and allows resetting the device. This tab contains the Terminal model, oriented in space according to accelerometer indications. The model can be rotated by mouse. Parameter values, which are beyond the limits, wrong coordinates, exceeding of maximum incline angle and responses on inputs are shown in red.

If there is a PIN code in the Terminal, the program will request it to access the settings. By wrong code entering the Terminal will disconnect from the computer, reset, connect to the Configurator again and wait for the right code enter.

For remote configuration and troubleshooting of the Terminal, click Select device... button. In the window appeared, enter your login and password to get the access to the remote configuration server. You can get the login and the password in GalileoSkay Ltd. department of technical support or by clicking the Register new user button.



After successful authorization on the server, the form of terminals list management will become available. When connecting for the first time, the list of the controlled terminals will be empty. To add a Terminal to the list, click Register Device button. During registration the Configurator will request a password for a particular Terminal, a factory password corresponds to IMEI of the Terminal; this can be later changed in the Configurator by the user. Terminals may be grouped.



After selecting a particular Terminal, it can be controlled via the Configurator, the same way as it occurs with the USB connection.

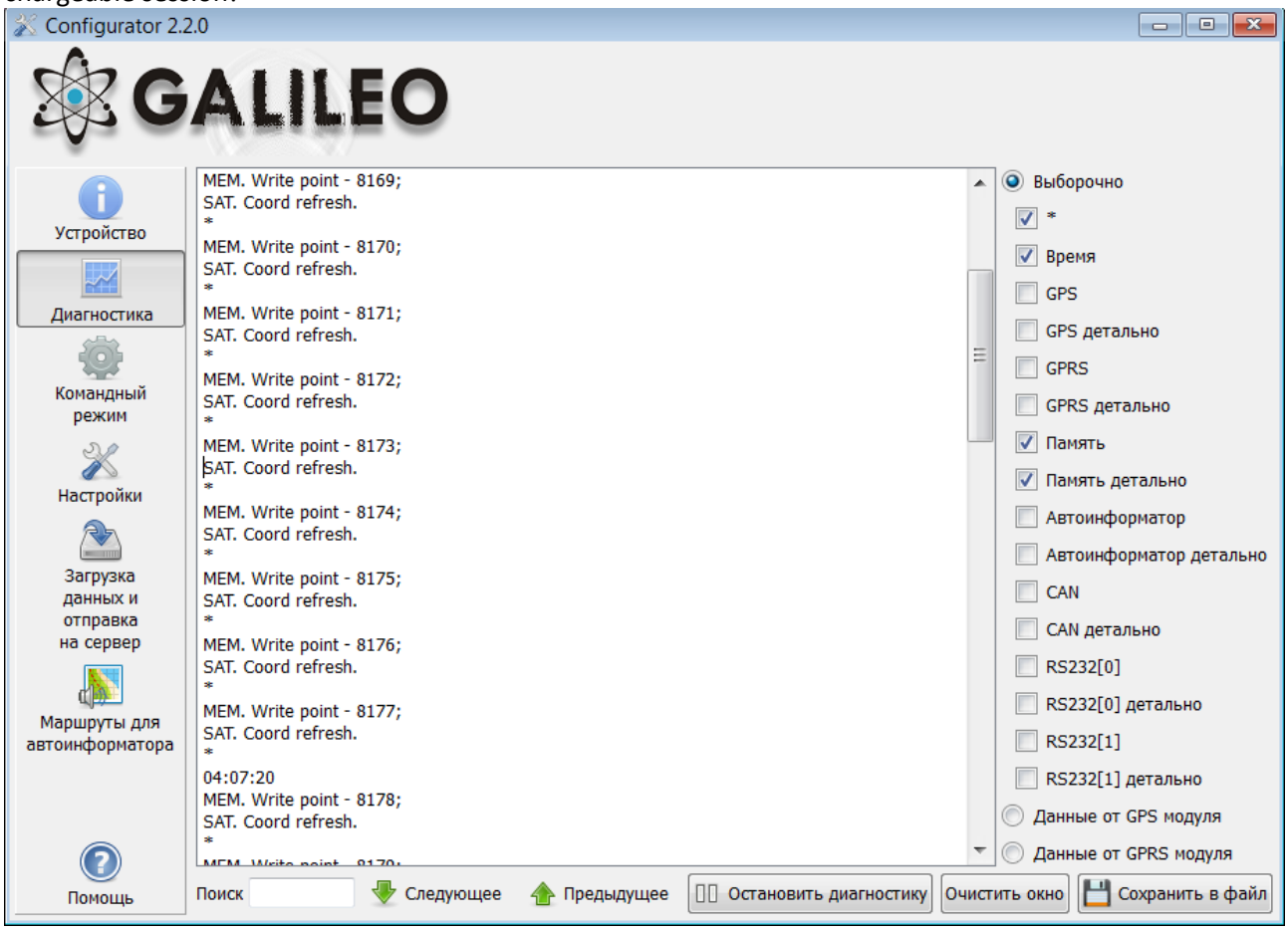
9.3 Troubleshooting tab

This tab allows seeing the current Terminal state through the troubleshooting reports.
The troubleshooting mode has the following buttons:

1) **Start /Stop**
   The time scale displays the information about the server connection, packet recording, updating coordinates and etc. with a 10 sec interval.
2) **Clear troubleshooting window**
3) **Save** the Terminal`s troubleshooting results as a log-file which can be opened by any text editor.
4) **Search** in the troubleshooting history file.

GSM unit debug info

Attention!
If the service has already been registered by the Terminal, another GPRS connection is only possible through switching off the GSM modem. It means that no money will be lost due to the minimum chargeable session!



Troubleshooting messages	Description	Possible causes
GSM. Success turn on.	GSM unit is powered. Turning on is successful.	
GSM. Not success turn on!	GSM unit is powered. Turning on is denied by the unit.	
GSM. Success init.	GSM module initialization is successfully performed.	
GSM. Not success init!	GSM module initialization failed.	
GPRS. Activated.	GPRS initialization is successfully performed.	

GPRS. Not activate.	GPRS initialization failed.	GPRS is not activated on this SIM card. Not enough money on the account. GSM network is overloaded.
GPRS. Success connect to server.	Device server connection is successful.	
GPRS. Not success connect to server.	Device server connection failed.	The Server access is denied or wrong server settings for the device.
GPRS. Reconnect Number=№	Number of server reconnections. № - reconnection number.	
GPRS. Firstpack OK.	First packet has been sent to the server.	
GPRS. Firstpack False.[0]	The device has sent the first packet, but there is no confirmation at TCP/IP level.	GSM network is overloaded. The packet has been blocked by device brandmauer or FireWall.
GPRS. Firstpack False.[1]	The device has sent the first packet, but there is no confirmation at the application level.	GSM network is overloaded. The server is not handling the first packet.

SMS debug info

Troubleshooting message	Description
SMS. RX SMS.	A new SMS message is received
SMS. TelNum: +79112299922	received from a given phone number
Command: ID	ID command is received
SMS. TX OK.	Message is successfully sent
SMS delfromslot 1	handled SMS deleting (from the first SIM card slot)
Not reply SIM. Slot 1	no SIM card reply (from the first SIM card slot)
GSM. No SIM-card	no SIM card reply (the card is probably not inserted)

Internal Flash memory debug info (track memory)

Troubleshooting message	Description
MEM. Inp-s	Point record reason is the change of inputs state;
MEM. Turn,dist	Point record reason is the change of distance between previous and new place or angle of driving direction;
MEM. Time	Record reason is time;
MEM. Write point – 200	Point with sequence number 200 is recorded.

GPS unit debug info

Troubleshooting message	Description	Possible causes
SAT. Coord refresh.	Coordinates for current record have been updated by GPS unit. The vehicle is considered to be moving, packet has not been filtered off.	
SAT. Coord not refresh.	Coordinates for current record have not been updated. Filtering at stops is activated.	
SAT. Temper is low than -40	Device temperature is lower than -40ºC. Operation at lower temperatures is impossible.	
SAT. Temper is high than 65	Device temperature is higher than +65ºC. Operation at higher temperatures is impossible.	
SAT. Time out. Restart MCU.	No GPS data for 60 seconds. Device reset.	GPS unit is out of order. GPS unit failure.
GLONASS. Message received. Len = 401	Terminal received information from GLONASS unit. 401 byte is received.	
GPS. Message received. Len = 172	Terminal received information from GPS unit. 172 byte is received.	
GPS. Change baud rate = 1	Attempt to set GPS unit rate. Attempt № 1.	

SAT. Fix = 1	Current position is fixed (0 – not fixed);	
SAT. SatInUse = 7	7 satellites are used for navigation;	
SAT. Valid = 1	Coordinates are right (they can be used for location determination). This *Valid* is not related to *valid* in packet and status.	
Galileo uses GLONASS	Terminal uses GLONASS system.	
Galileo uses GPS	Terminal uses GPS system.	
SAT. Incorrect data from GLNS/GPS module	Wrong data are received from the used unit (probably because of processor overload)	
SAT. Time out. Restart MCU	Terminal gets no data from receivers (GLNS/GPS)	
SAT. High Speed = 200	Navigation speed data filter turned on (this data will be skipped by the unit).	
SAT. HDOP is high = 6	Navigation HDOP data filter turned on (this data will be skipped by the unit).	
SAT. Jump = 5000	Navigation coordinate data filter turned on (leap to large distance occurred).	
SAT. First start OK. Sat count >= MIN	By the Terminal turning on the unit must get more MIN satellites (only in this case, the data are reliable).	

Other troubleshooting messages are not described, but they have intuitive names. If there are any questions, you will find the answer at our forum.

9.4 Command mode tab

This tab is intended to message a single command or a set of commands to the Terminal.

The command mode has the following buttons:

1) **Run commands;**
2) **Run single command;**
3) **Open from file;**
4) **Save to file.**

The commands will be identified whether you use capital or lower-case letters or both in turn.

Attention!

There are no spaces in command name!
Spaces between parameters are not allowed!
Commands and parameters are separated by space.
Commands are separated by Enter.

Single command example

An example of a command with a parameter:

In the Commands window enter APN internet.beeline.ru,beeline,beeline as shown in the figure above and press **Run single command** button. The command and a response will be displayed in the Responses window.

Command**:** APN internet.beeline.ru,beeline,beeline
Response**:** GPRS:APN=INTERNET.BEELINE.RU, user=BEELINE, pass=BEELINE;

To access the parameters in the Terminal memory you should use a command without parameters!

An example of a command without a parameter:

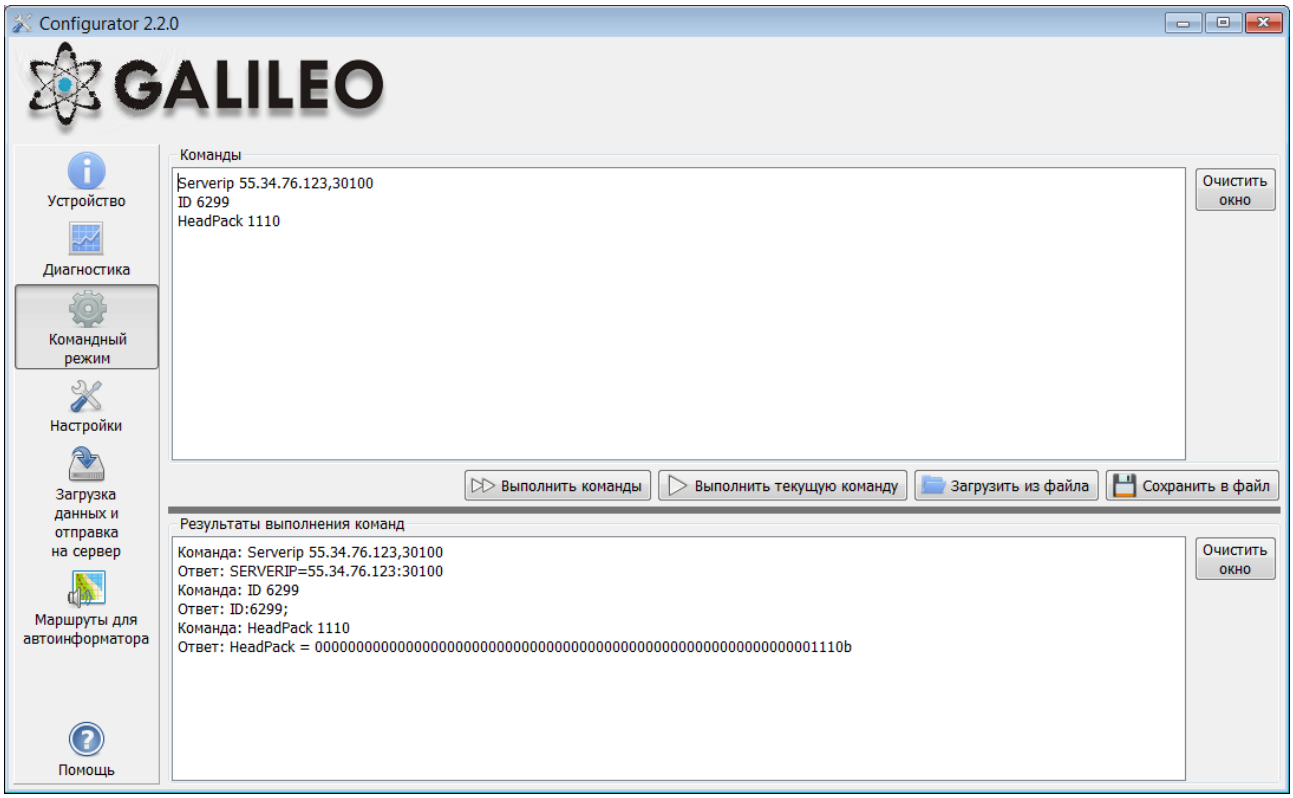
APN command	Request: **APN** Response: **GPRS:APN=INTERNET.BEELINE.RU, user=BEELINE, pass=BEELINE;**

Set of commands example

Enter the necessary commands in Command window, each beginning a new line, as shown in the figure below and press the Run commands button.

Example: Serverip 55,34,76,123,30100
ID 6299
HeadPack 1110

The given commands and results will be displayed in the Responses window.
Command: Serverip 55,34,76,123,30100
Response: ServerIp=55.34.76.123:30100
Command: ID 6299
Response: ID: 6299
Command: HeadPack 1110
Response: HeadPack = 00000000000000000000000000000000000000000000000000000000000001110b

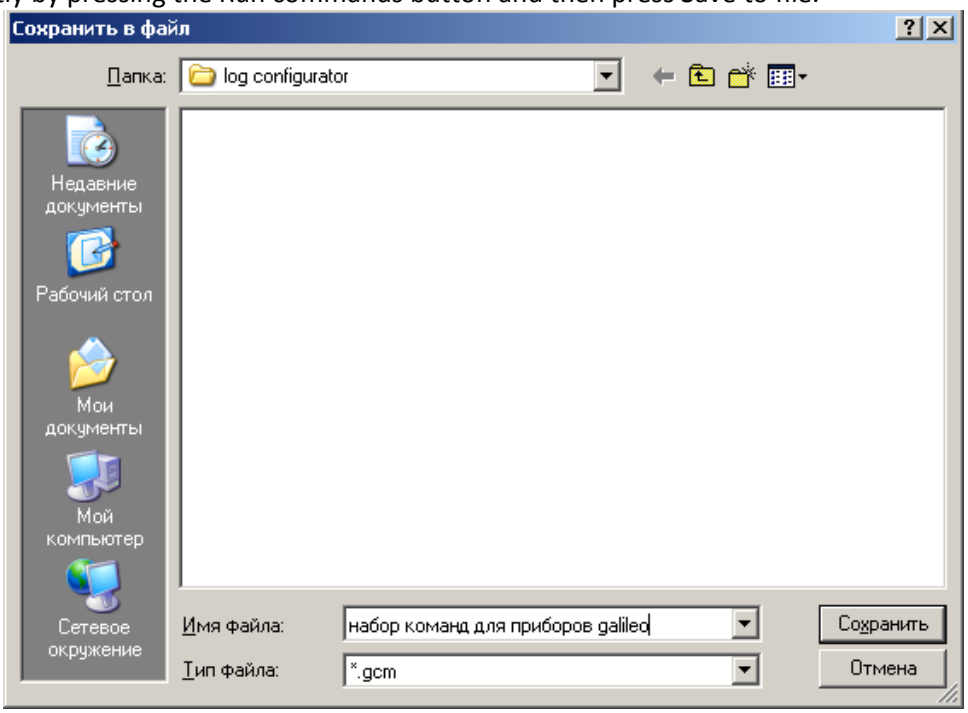


Example of saving and downloading parameter set

For quick configuration of several Terminals with the same set of commands it is recommended to run the commands from a pre-saved file. To do this, enter a list of commands in the Command window. Make sure that they are typed correctly by pressing the Run commands button and then press Save to file.

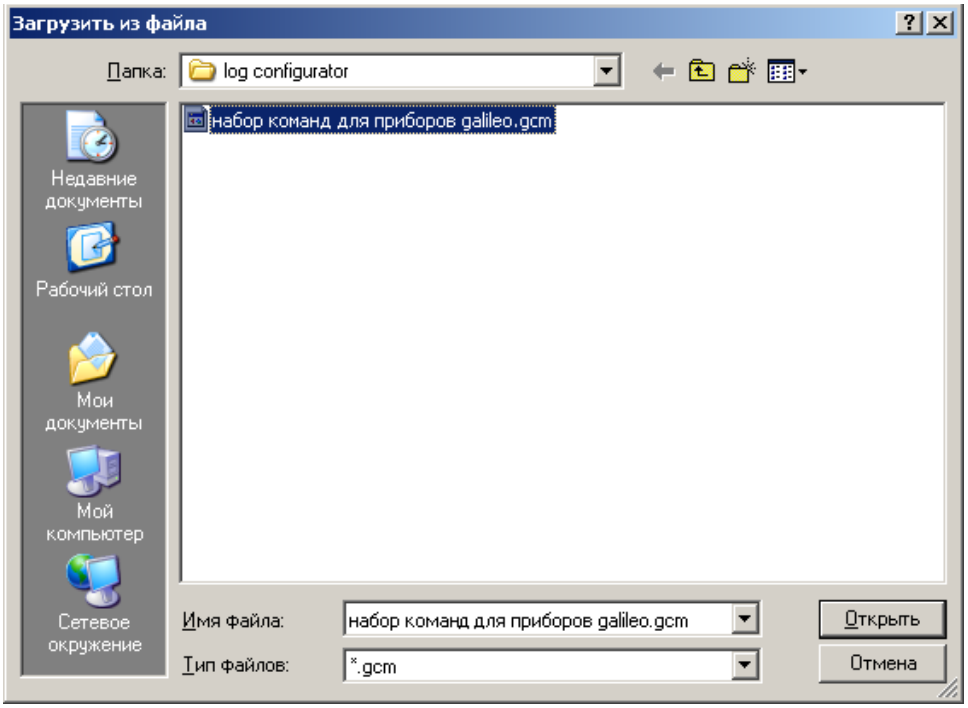
In the opened window, you will be offered to save the file in log configurator folder.

Type the file name and press Save button as shown in the right-hand figure



The file will be saved in log configurator folder. Then press **Open from file…** button.

Select the necessary file and press Open button, as shown in the right-hand figure.



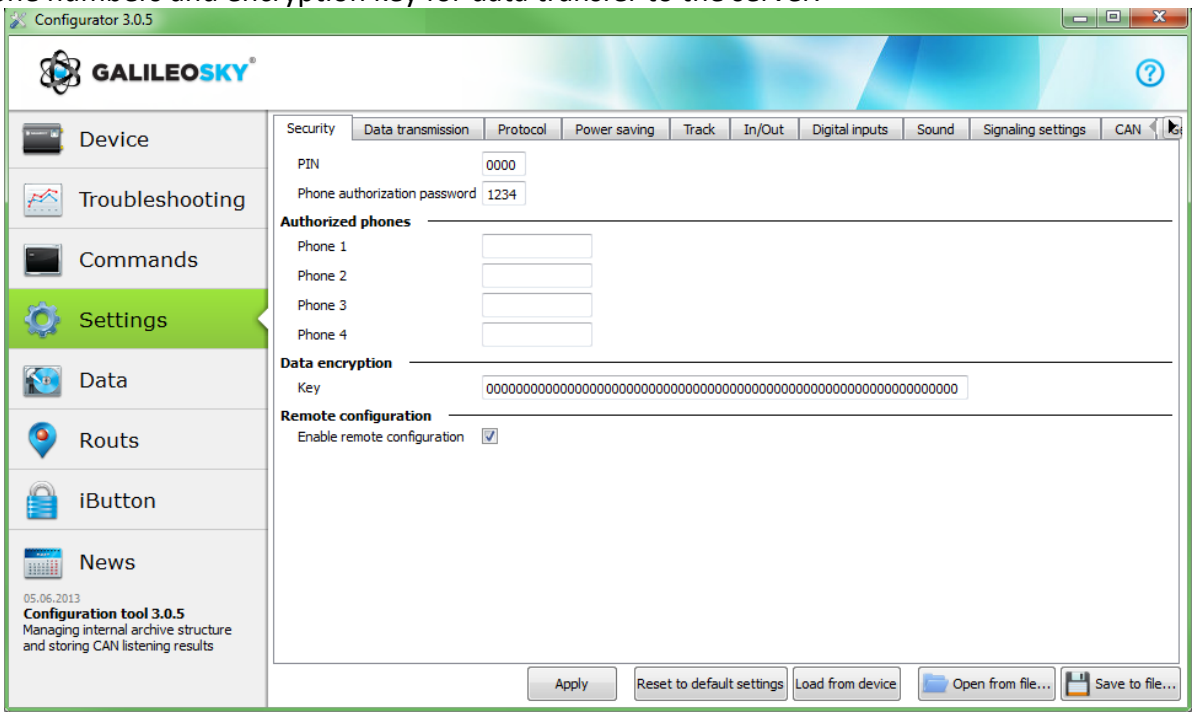
To run several commands at the same time press **Run commands** button.
To run only one command it is necessary to go to it in Commands window and press **Run single command** button.

9.5 Graphic interface settings

All main settings of the Terminal are placed on tabs in the program upper part.

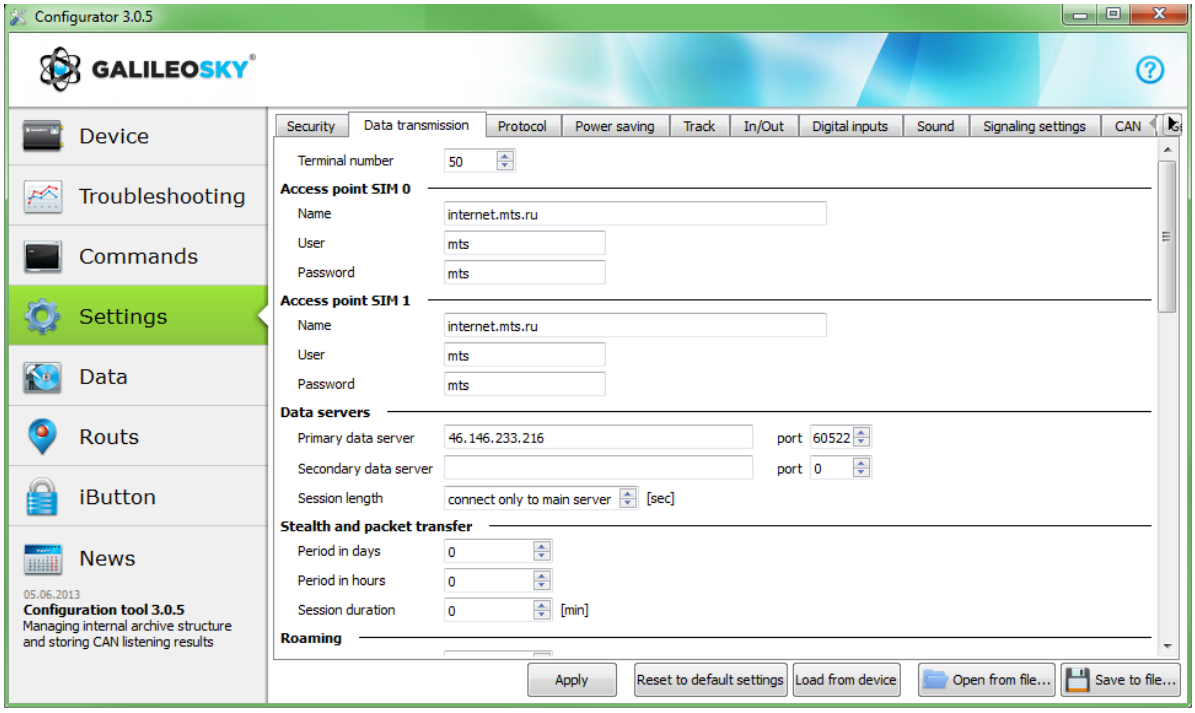
9.5.1 Security

This tab allows setting SIM-cards PIN code, phone authorization password, list of authorized phone numbers and encryption key for data transfer to the server.



9.5.2 Data transmission

This tab allows setting SIM-card PIN code, APN for the Internet access, monitoring data processing servers, packet data transmission and international roaming.

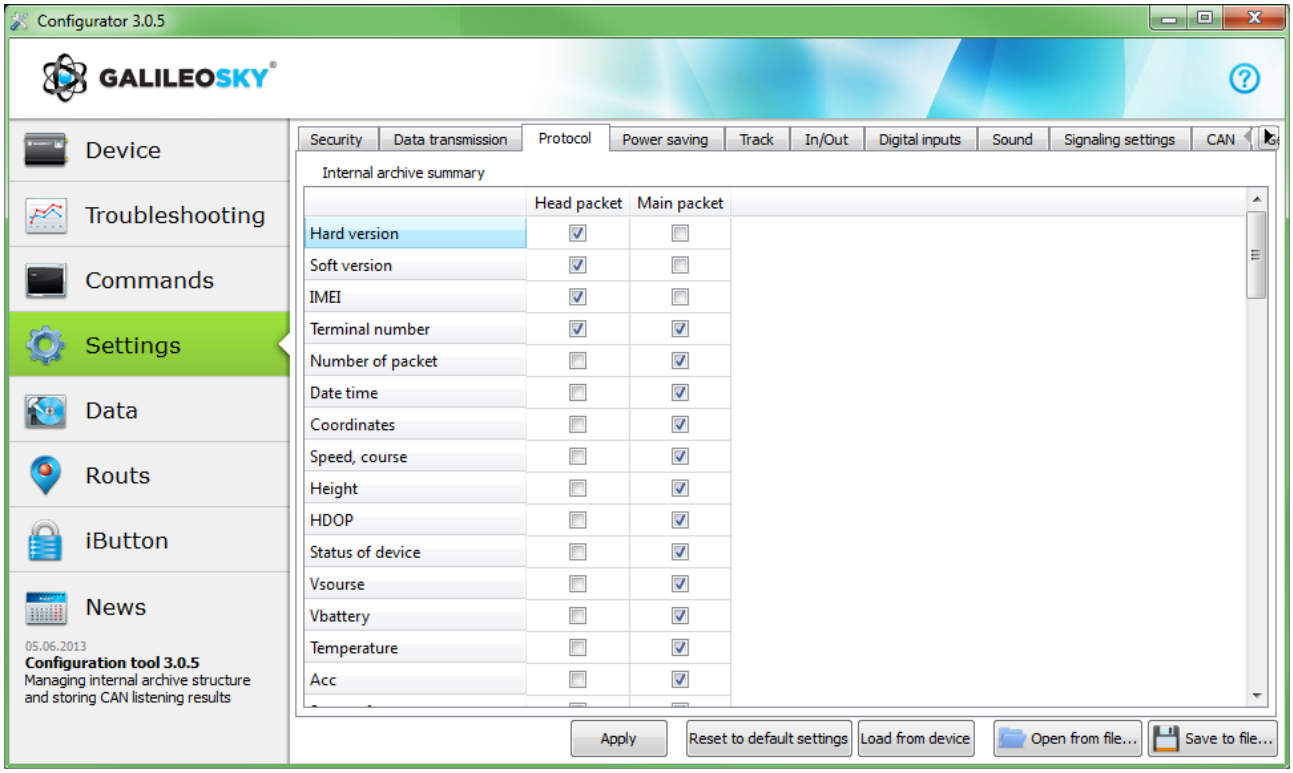


9.5.3 Protocol

The Terminal has its own data transmission protocol developed by GalileoSky Ltd.
During device operating and data sending to the server, the following stages are possible:

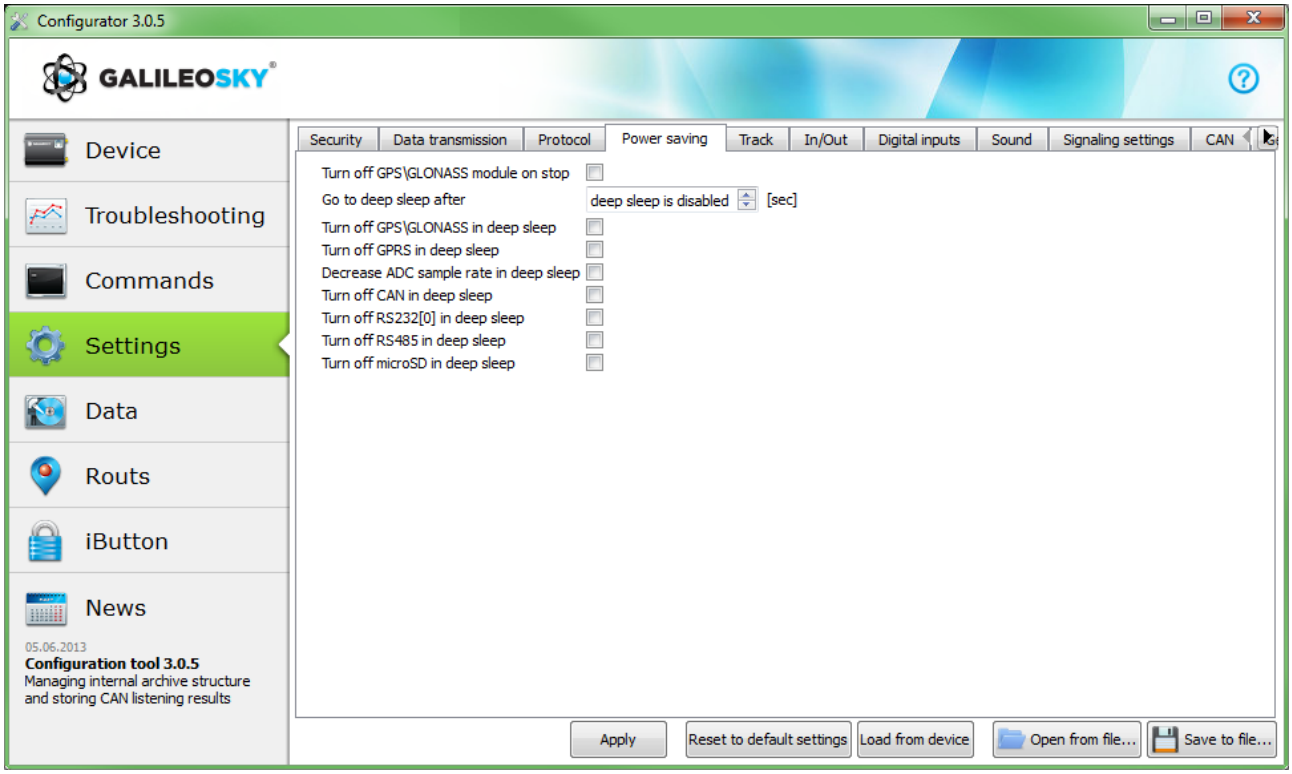
1) Initialization of TCP/IP connection (does not need any additional settings);
2) Sending of initialization data described in the Head packet column (the data to be sent to the server are ticked in the first column);
3) If the Terminal has passed the first two stages, it starts sending accumulated packets according to the format described in the Main packet column.

To send the data the modem establishes a server connection and keeps it active even after sending the packet. It is done to save server connection traffic used to establish the connection.



9.5.4 Power saving

This tab allows setting shutdown options of the Terminal units at stop, to reduce power consumption.



9.5.5 Track

This tab allows setting archive storage place and recording periods of coordinates at stops and in motion, details of track and false coordinates filtering.

The device filters coordinates by speed, acceleration, travelled distance, horizontal accuracy, number of satellites.

In addition, the Terminal allows filtering of coordinates crowding during stops by supply voltage at vehicles battery (Mhours command).

Parameters:

- supply voltage at stopped engine;
- supply voltage at started engine;

The first parameter is selected in the following way:

1) stop the engine for 5 minutes;
2) save the Vpit voltage parameter from Device tab.

The second parameter is selected in the following way:

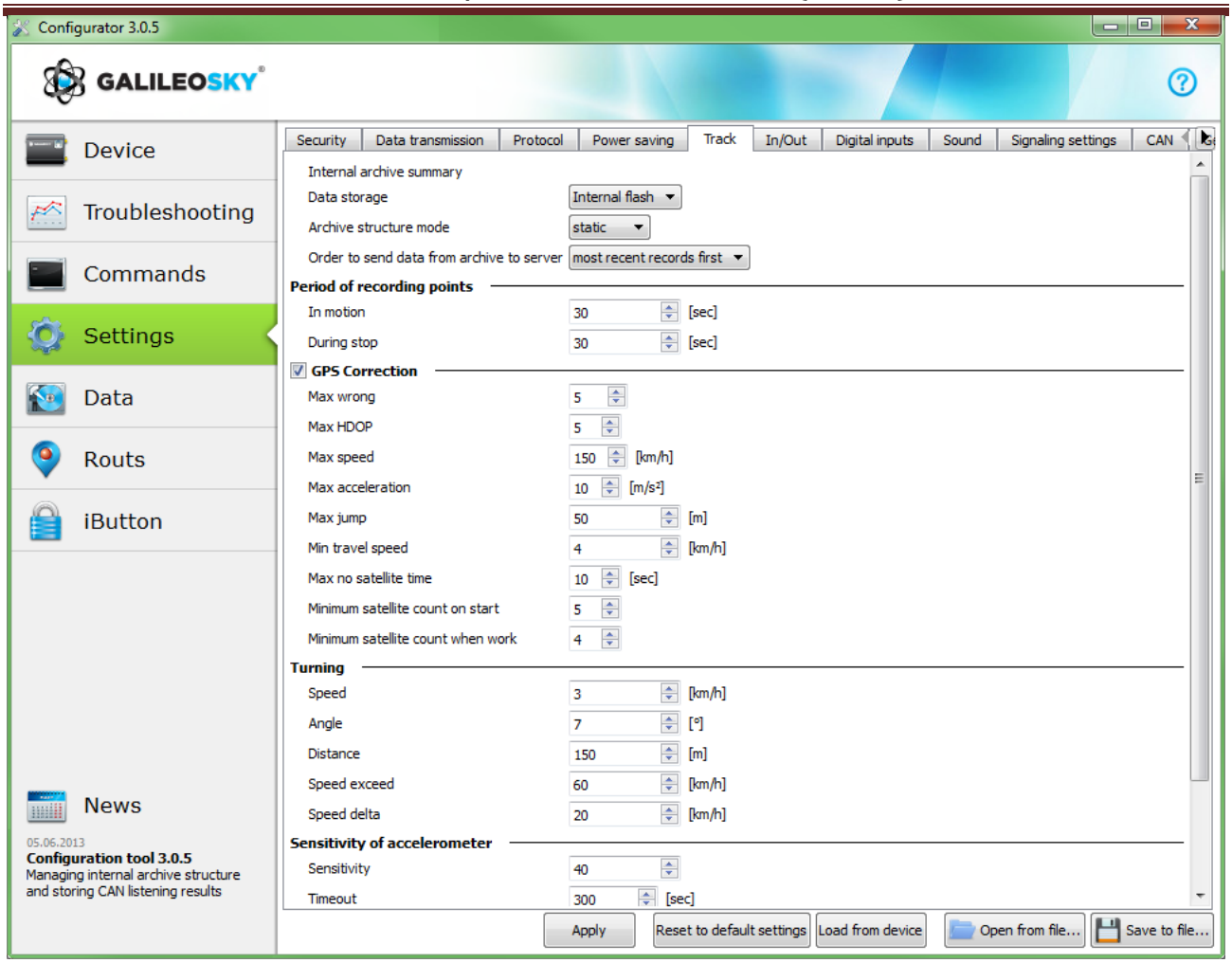
1) start the engine;
2) save the Vpit parameter;
3) parameters of the mhours command are filled in and sent to the Terminal.

When the engine is started, the 9th bit will be set in the device status (Table 3. Device status field explanation).

Each Terminal is equipped with an accelerometer which allows filtering coordinates crowding during stops. It is based on vehicles vibration.

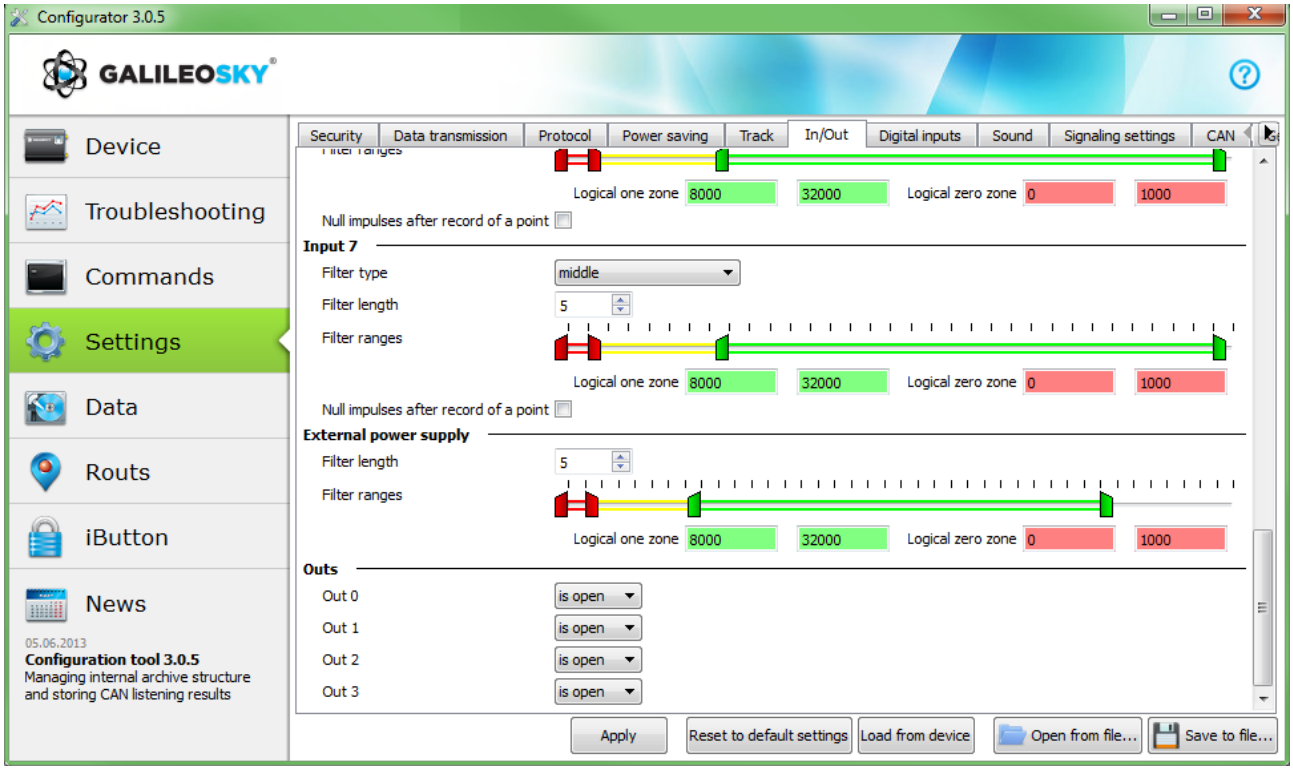
Parameters:

- Sensitivity– a standard unit, where the sensitivity of the 600 units corresponds to the acceleration of 1g (gravitational acceleration)
- Time parameter. The Terminal switches on this filter when there is no vibration within a certain time period. The filter operates until the necessary amplitude acceleration is reached.


Configurator 3.0.5
GALILEOSKY
Device
Troubleshooting
Commands
Settings
Data
Routs
iButton
News
05.06.2013
Configuration tool 3.0.5
Managing internal archive structure and storing CAN listening results
Security
Data transmission
Protocol
Power saving
Track
In/Out
Digital inputs
Sound
Signaling settings
CAN
Internal archive summary
Data storage
Internal flash
Archive structure mode
static
Order to send data from archive to server
most recent records first
Period of recording points
In motion
30
[sec]
During stop
30
[sec]
GPS Correction
Max wrong
5
Max HDOP
5
Max speed
150
[km/h]
Max acceleration
10
[m/s²]
Max jump
50
[m]
Min travel speed
4
[km/h]
Max no satellite time
10
[sec]
Minimum satellite count on start
5
Minimum satellite count when work
4
Turning
Speed
3
[km/h]
Angle
7
[°]
Distance
150
[m]
Speed exceed
60
[km/h]
Speed delta
20
[km/h]
Sensitivity of accelerometer
Sensitivity
40
Timeout
300
[sec]
Apply
Reset to default settings
Load from device
Open from file...
Save to file...

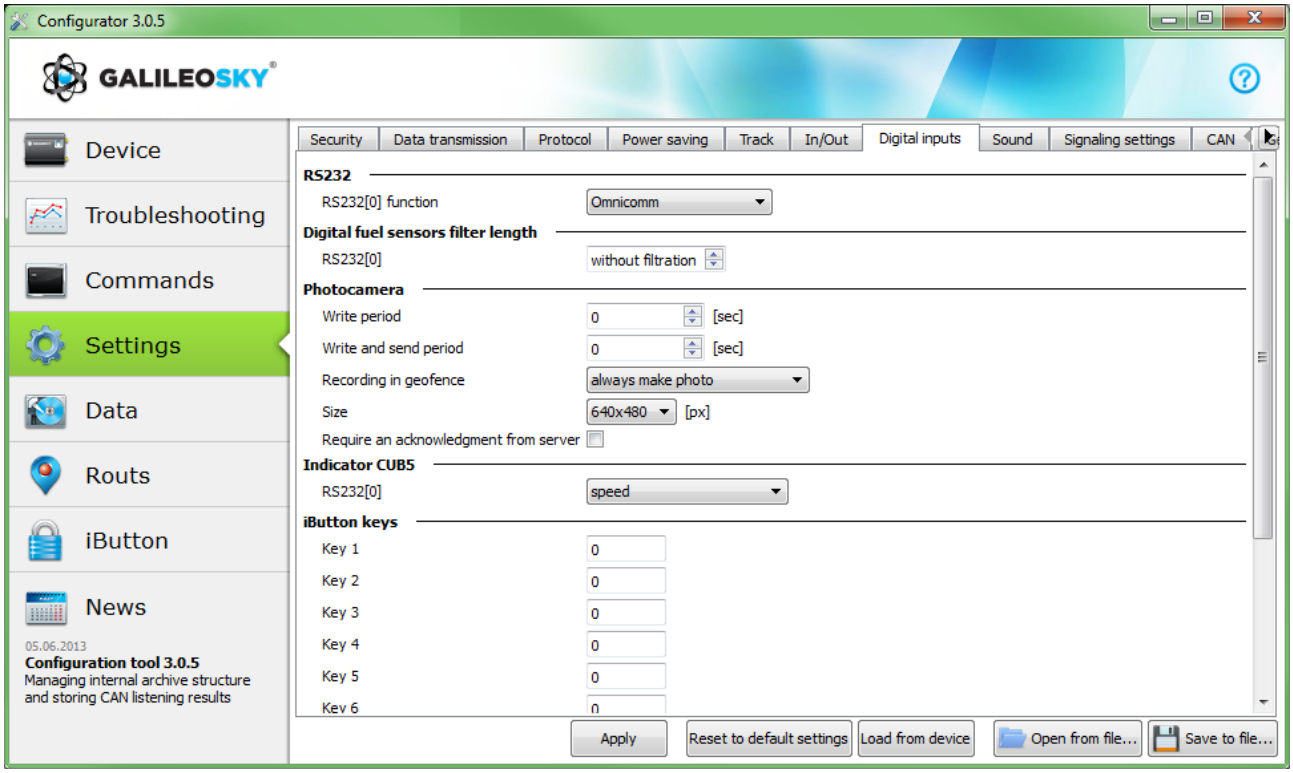
9.5.6 Inputs/Outputs

For inputs operating principles see section Discrete-analog inputs (DAI).
For discrete outputs description see section Transistor outputs (0/1).



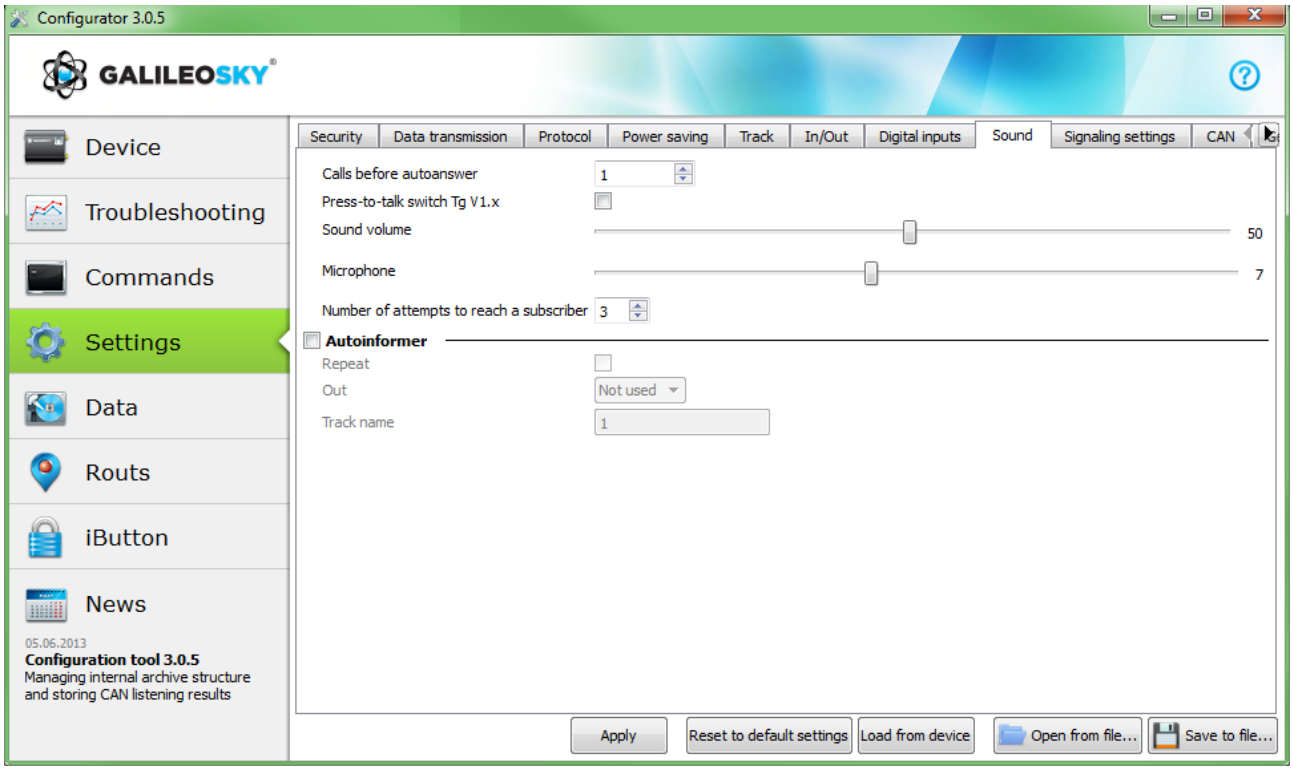
9.5.7 Digital inputs

This option allows choosing the type of peripheral connected to RS232 inputs, setting iButton keys, setting up periodical camera shooting.



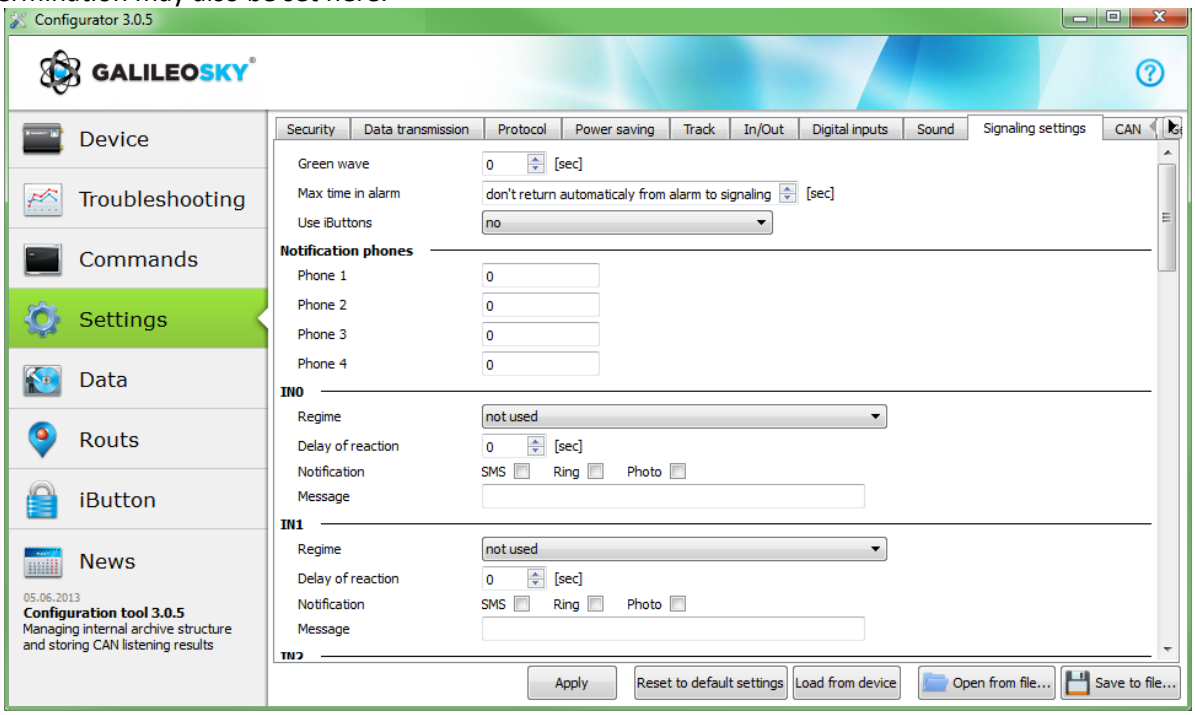
9.5.8 Sound

This option allows setting a microphone and sound gain via a GSM channel, the number of calls before autoanswer, as well as parameters of the Autoinformer.



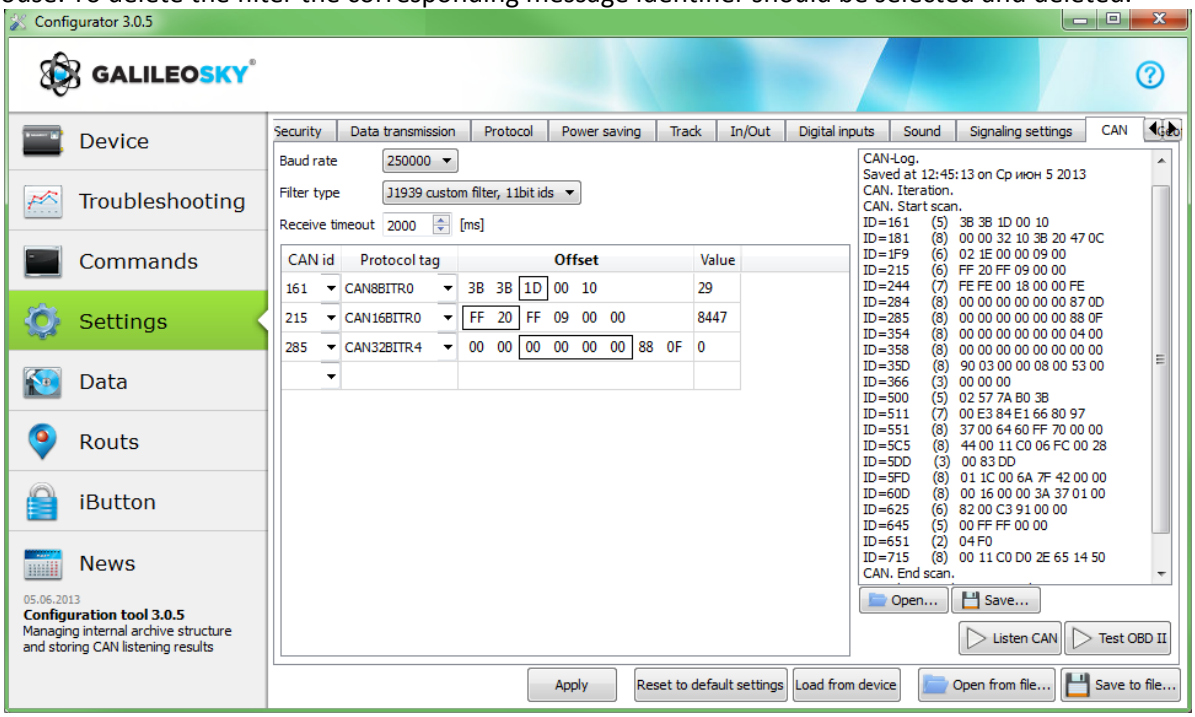
9.5.9 Signaling

This option allows setting the response of the Terminal to inputs state change, speed and coordinate change. You can set telephone numbers for SMS or call in case of signaling activation. Strike and incline determination may also be set here.



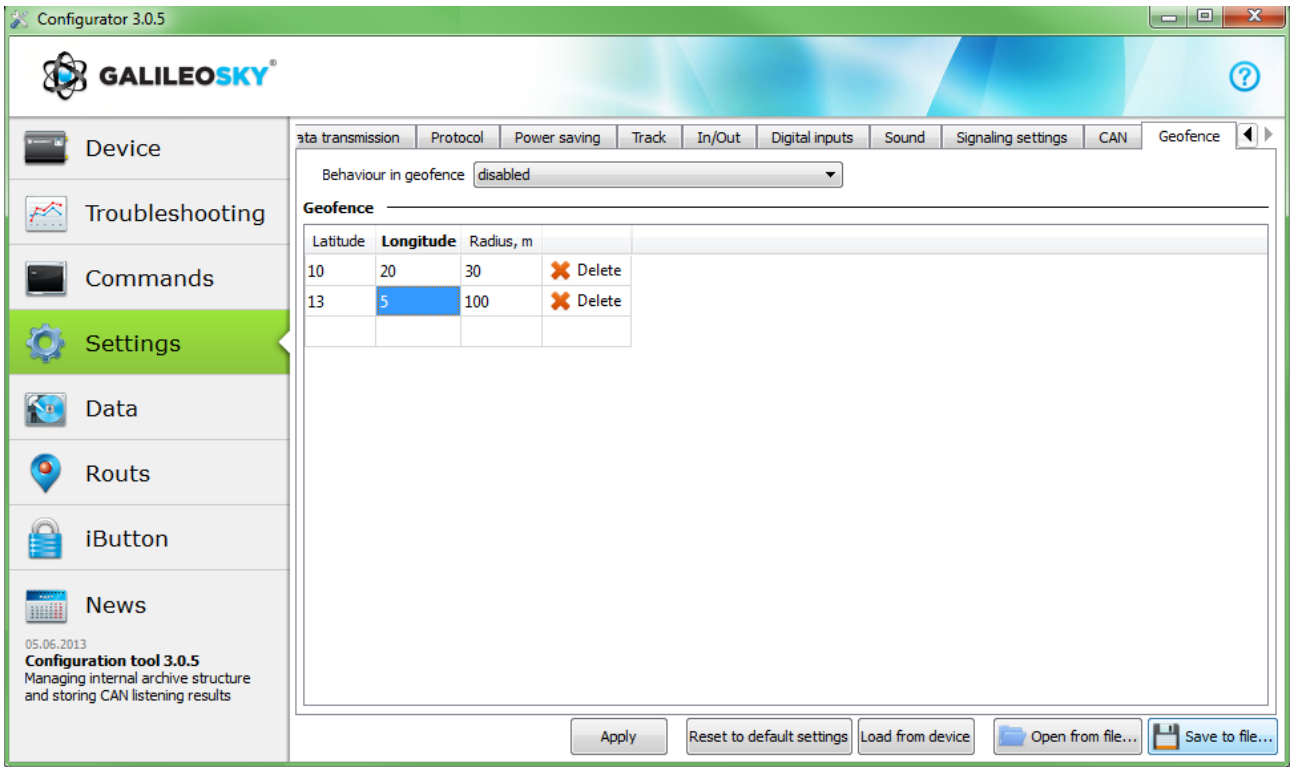
9.5.10 CAN

This option allows setting a CAN-filter and scanning the CAN-bus for message identifiers being used.
After clicking Listen CAN the CAN scanner will be activated and received messages will be displayed in the right-hand panel. When scanning is completed, it is possible to set tags in the protocol, in which the bus data will be sent. To do this: choose CAN identifier and tag and point transmitted part of the message with a mouse. To delete the filter the corresponding message identifier should be selected and deleted.



9.5.11 Geofences

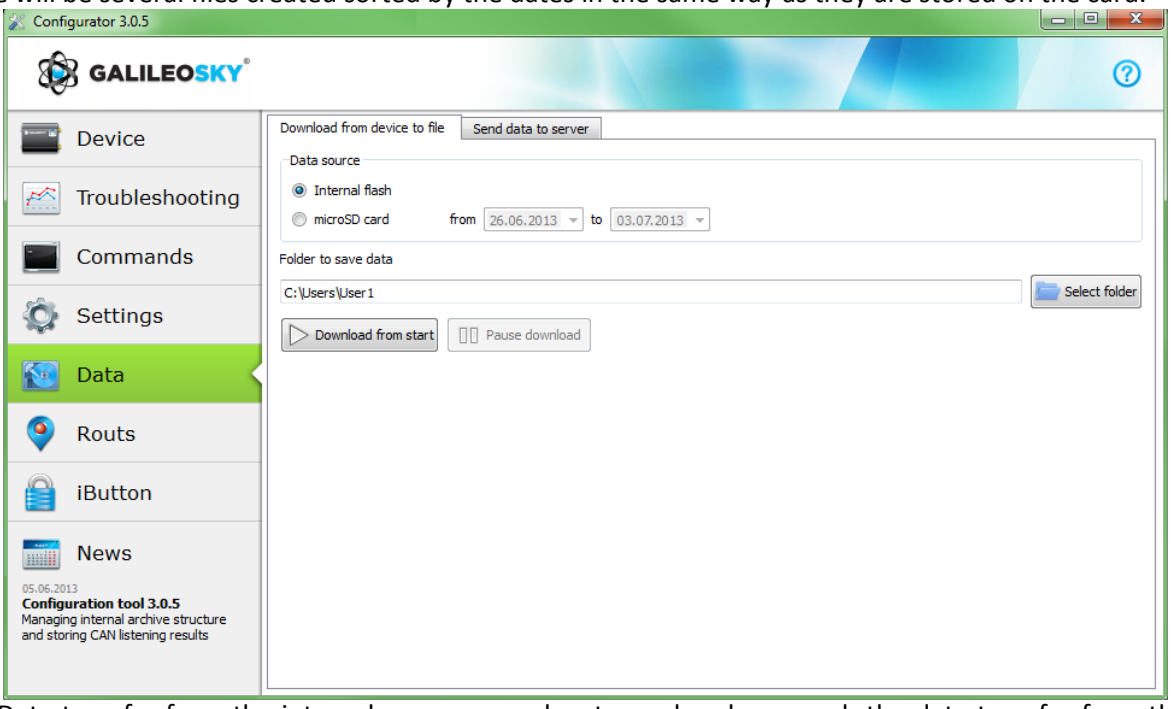
On this tab it is possible to set the list of Geofences and behavior of the Terminal inside and outside them.



9.6 Data loading and sending to server

9.6.1 Data loading from the Terminal to file

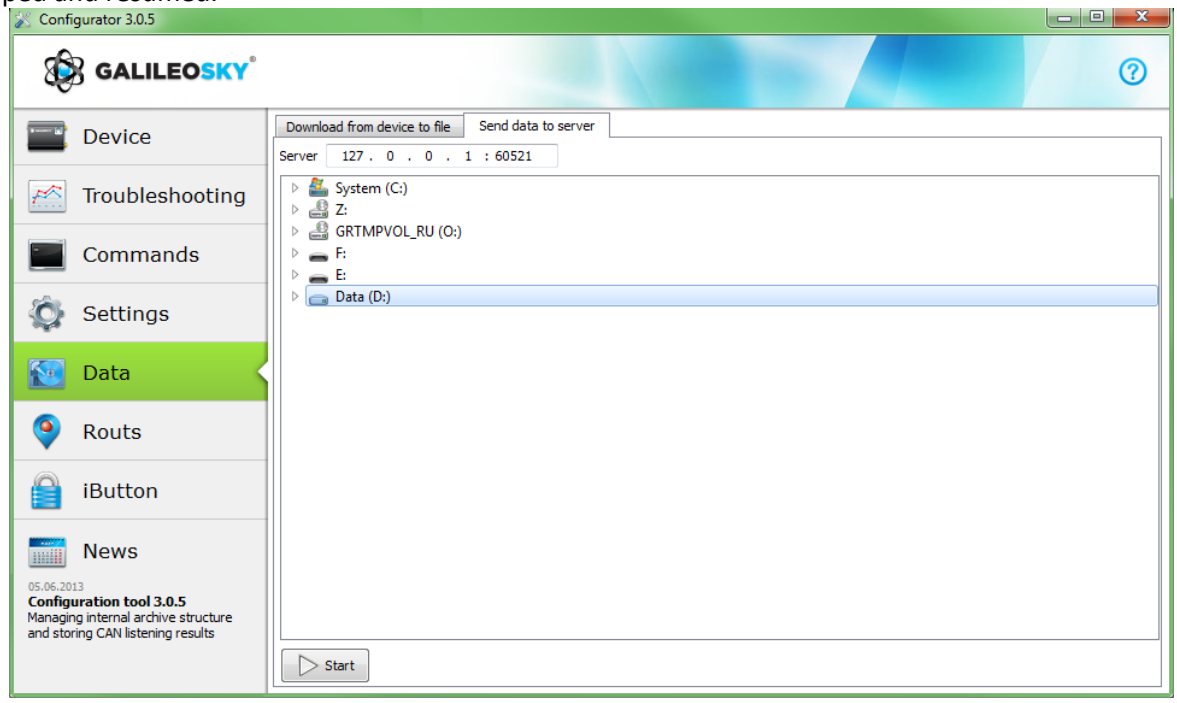
This option allows transferring the data from the internal memory or a SD-card to computer files via a USB cable. By data loading from the internal memory one InternalFlash.csv file will be created, in the latter case there will be several files created sorted by the dates in the same way as they are stored on the card.



The Data transfer from the internal memory can be stopped and resumed; the data transfer from the SD card can be stopped only if you disconnect the USB cable.

9.6.2 Sending data to server

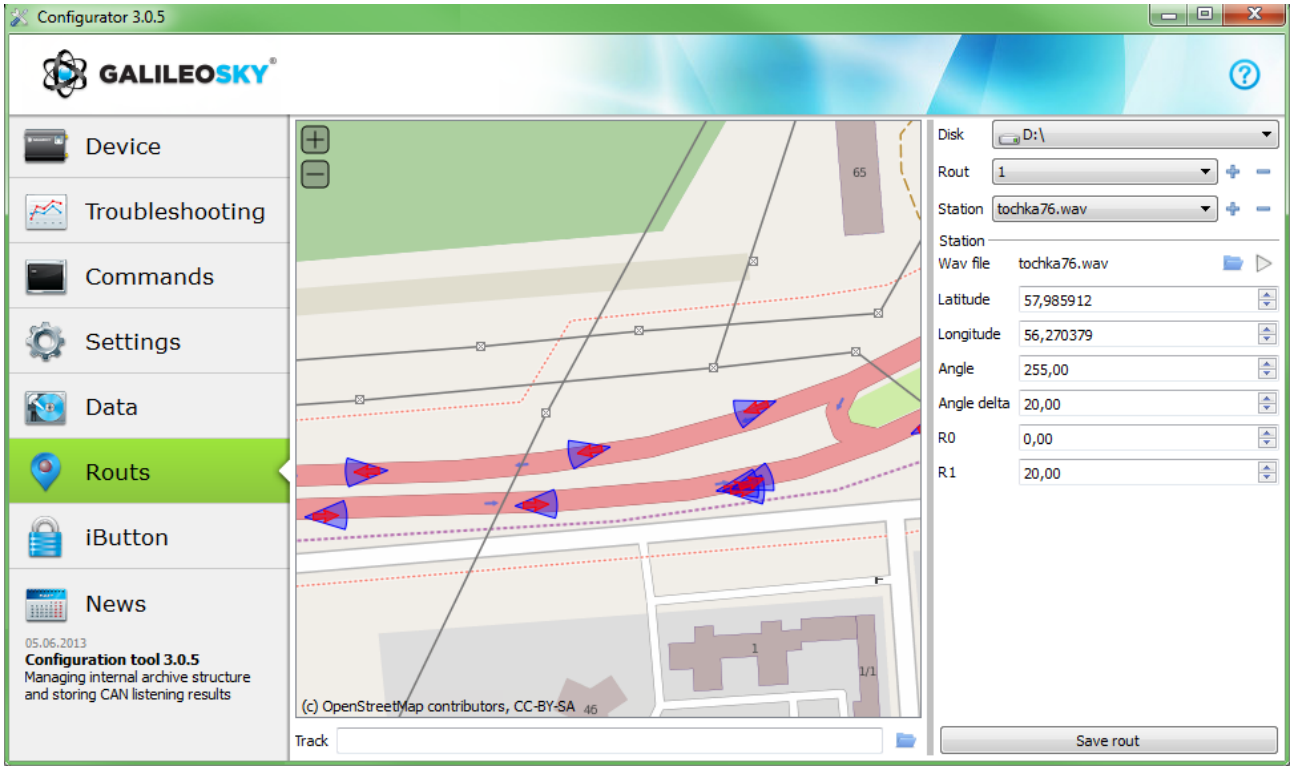
This option allows sending the data previously transferred from the Terminal to any server emulating the GalileoSky protocol. To send it you should specify the IP-address and the server port and choose a file or a catalogue to be sent. If a catalogue is chosen, the program will send all its data files. The process can be stopped and resumed.



9.7 Routes for Autoinformer

This tab contains a graphical Autoinformer zones editor (section Autoinformer function).
The Internet access is required to display the map.
To edit the zones:

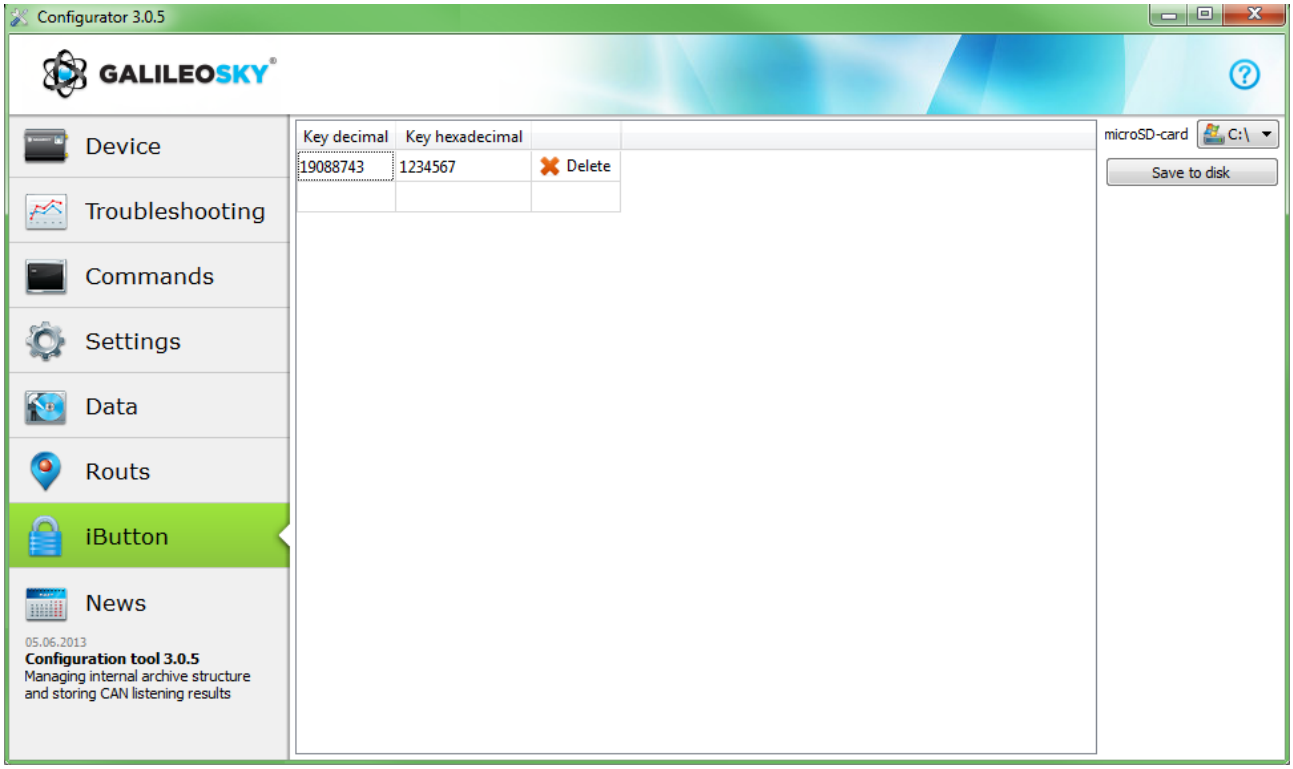
1) Insert a micro-SD card into the computer, choose the disk in the drop-down list. The route list and the track list will be loaded automatically.
2) Choose an edited route in the drop-down list or create a new one by clicking "+" on the right side of the route list. All stops will be loaded automatically, the map will move to the first stop.
3) Edit parameters of the zones. It can be done on the right panel as well as visually by moving red points with a mouse.
4) Create new zones. Click "+" on the right side of the stops list. A new zone will appear in the middle of the map, and then it can be edited.
5) Choose an audio file for the zone. It can be done in the Audio file drop-down list or you can load a new file by clicking "+" on the right side of the stops list. The following formats are supported: wav,mp3, flac, ogg, raw, gsm. The Configurator will automatically convert the file in appropriate format for the Terminal and copy it to the micro-SD card.
6) Press Save route to save changes to the micro-SD card.



To make sure all zones are correct, download the track developed after a trip. The Configurator supports the tracks uploaded from the internal memory of the Terminal or stored on the micro-SD card in the format csv.

9.8 Trusted iButton keys

This tab contains the editor of a trusted iButton keys list.



The list is stored on a microSD-card; to edit the list, perform the following:

1. Eject the microSD-card from the Terminal.
2. Insert the microSD-card into the computer and choose the disk in the drop-down list; the list of trusted iButton keys will be loaded automatically.
3. Keys may be entered either in decimal or in hexadecimal form; the corresponding value in another column will be converted automatically.
4. Click Save to disk button to save the changes to the microSD-card.

The list of keys is stored in the keys.bin file; it can be copied and used in microSD-cards of other Terminals.

10 *Commands list*

To request current settings you need to issue command without any parameters.

10.1 Settings for SMS control

Command format	**AddPhone xxxx[,n]**
Parameters	**xxxx** - is a four-digit password, 1234 by default **n** – slot number (0-3) where a telephone number will be saved.
Explanation	When you configure the Terminal with a cell phone, you should first authorize it by using the command. Up to 4 telephone numbers can be authorized.
Example	Request: AddPhone 1234 Reply: Phones (0)=89010123456 (1)= (2)= (3)=

Command format	**ChangePass aaaa**
Parameters	**aaaa** – is a numeric four-digit password;
Explanation	Changing and viewing the current password.
Example	Request: ChangePass 5678 Reply: Password changed to '5678'

Формат команды	**Phones P1,P2,P3,P4**
Parameters	**P1,P2,P3,P4** – authorized phone numbers written in international format
Explanation	Getting and setting the list of authorized phones
Example	Request: Phones +7901012345,,, Reply: Phones (0)=+79010123456 (1)= (2)= (3)=

10.2 Data transmission settings

Command format	**APN a,u,p**
Parameters	**a** – access point name **u** – user **p** – password
Explanation	Access point settings for SIM0
Example	Request: APN internet.beeline.ru,beeline,beeline Reply: GPRS:APN=internet.beeline.ru, user=beeline, pass=beeline

Command format	**APN2 a,u,p**
Parameters	**a** – access point name **u** – user **p** – password
Explanation	Access point settings for SIM1
Example	Request: APN2 internet.beeline.ru,beeline,beeline Reply: GPRS2:APN=internet.beeline.ru, user=beeline, pass=beeline

Command format	**OPS0 n1,n2,n3,n4,n5,n6,n7,n8,n9,n10,n11,n12,n13,n14,n15**
Parameters	**n1-n15** – preferred GSM-networks.
Explanation	A list of preferred GSM- networks for SIM0. The network is defined by a mobile country code and a mobile operator code (the list of codes is given in http://www.itu.int/dms_pub/itu-t/opb/sp/T-SP-E.212A-2010-PDF-E.pdf), for example, the Russian Federation code is 250.
Example	Request: OPS0 25001,25099 Reply: OPS0:25001,25099,,,,,,,,,,,,;

Command format	**OPS02 n16,n17,n18,n19,n20,n21,n22,n23,n24,n25,n26,n27,n28,n29,n30**
Parameters	**n16-n30** – preferred GSM-networks.
Explanation	Additional list of preferred GSM-networks for SIM0.
Example	Request: OPS02 25001,25099 Reply: OPS02:25001,25099,,,,,,,,,,,,;

Command format	**OPS1 n1,n2,n3,n4,n5,n6,n7,n8,n9,n10,n11,n12,n13,n14,n15**
Parameters	**n1-n15** – preferred GSM-networks.
Explanation	A list of preferred GSM-networks for SIM1.
Example	Request: OPS1 25001,25099 Reply: OPS1:25001,25099,,,,,,,,,,,,;

Command format	**OPS12 n16,n17,n18,n19,n20,n21,n22,n23,n24,n25,n26,n27,n28,n29,n30**
Parameters	**n16-n30** – preferred GSM-networks.
Explanation	Additional list of preferred GSM-networks for SIM1.
Example	Request: OPS12 25001,25099 Reply: OPS12:25001,25099,,,,,,,,,,,,;

Command format	**SIMSwitch mode**
Parameters	**mode** – SIM switching algorithm: 0 – only SIM 0 is used 1 – cyclic switching between the SIM-cards, if you cannot send the data for 9 minutes 2 – switching to the list of preferred GSM-networks.
Explanation	Setting of an algorithm of switching between the SIM-cards.
Example	Request: SIMSwitch 1 Reply: SIMSwitch:1;

Command format	**Serverip host,port**
Parameters	**host** – domain name of a server or its IP-address; **port** – server port.
Explanation	Main server parameters where the monitoring data will be transmitted to.
Example	Request: Serverip m.7gis.ru,60521 Reply: SERVERIP=m.7gis.ru:60521 Request: Serverip 46.146.233.216,60521 Reply: SERVERIP=46.146.233.216:60521

Command format	**Serverip2 ip1,ip2,ip3,ip4,port**
Parameters	**host** –domain name of a server or its IP-address; **port** – server port.
Explanation	Additional server parameters.
Example	Request: Serverip2 m.7gis.ru,60521 Reply: Serverip2= m.7gis.ru: 60521

Command format	**ServersCfg t**
Parameters	**t** – Time of connection with one server, [sec]. When the value is equal to 0, the data will only be transmitted to the main server.
Explanation	Sets the time of server connection session.
Example	Request: ServersCfg 120 Reply SERVERSCFG:SeansTime=120;

Command format	**ID n**
Parameters	**n** - terminal number
Explanation	Changes terminal number.

Example	Request: ID 123 Reply: ID=123

Command format	**Roaming MCC_MNC,Size,Interval**
Parameters	**MCC_MNC** – a mobile code of the country where the data can be transmitted without any limitations (the list of codes is given in http://www.itu.int/dms_pub/itu-t/opb/sp/T-SP-E.212A-2010-PDF-E.pdf), for example the Russian Federation code is 250 or it may be a combination of a country and operator mobile codes. Zero means that there are no special roaming settings; **Size** – maximum number of bytes, which can be transmitted during one connection session in roaming. When the value is equal to 0, only the first packet is transmitted; **Interval** – connections interval in hours.
Explanation	Settings of data transmission in international roaming.
Example	Request: Roaming 25099,10000,24 Reply: ROAMING:Home=25099,MaxBytes=10000,Interval=24;

Command format	**Sputnic t**
Parameters	**t** – time of connection with the help of satellite modem, [sec]. When the value is equal to 0, the satellite modem is not used.
Explanation	Sets the time of connection with the help of satellite modem.
Example	Request: Sputnic 1200 Reply: SPUTNIC: 1200;

Command format	**Protocol n**
Parameters	**n** – Data transmission protocol version: 0 – GalileoSky protocol; 3 – EGTS.
Explanation	Choice of monitoring data transmission protocol to the server.
Example	Request: Protocol 0 Reply: PROTOCOL:0;

10.3 Server exchange protocol settings

Command format **HeadPack bbbbbbbbbbbbbb**

Parameters	**bbbbbbbbbbbbbb** - tag set from 1 to 128. If b is replaced by 1, the tag is on. If b is replaced by 0, the tag is off. Tag numeration order is given in Table 2. GalileoSky protocol tags.
Explanation	Head packet configuring**.**
Example	*Request: HeadPack 1110* *Reply: HeadPack= 00000000000000000000000000000000000000000000001110b* *This means that tags from the second to the fourth inclusive are on, and the first and the rest tags inclusive are off.*

Command format **HeadPack2 bbbbbbbbbbbbbb**

Parameters	**bbbbbbbbbbbbbb** - tag set from 129 to 256. If b is replaced by 1, the tag is on. If b is replaced by 0, the tag is off. Tag numeration order is given in Table 2. GalileoSky protocol tags.
Explanation	Head packet configuring**.**
Example	*Request: HeadPack2 110000* *Reply: HeadPack2= 110000b ,* *This means that tags 129, 130,131,132 are off and tags133 and 134 are on. All the following tags are off.*

Command format **HeadPackBit index,value**

Parameters	**index** –a tag number, which is on or off for transmission to the server **value** – 1 if the tag should be transmitted to the server 0 if the tag should not be transmitted to the server Tag numeration order is given in Table 2. GalileoSky protocol tags.
Explanation	Head packet configuring.
Example	*Initially the second tag is off:* *HeadPack= 1100b* *Switch on this tag.* *Request: HeadPackBit 2,1* *Reply: HeadPack= 1110b*

Command format **MainPack bbbbbbbbbbbbbb**

Parameters	**bbbbbbbbbbbbbb** – tag set from 1 to 128. If b is replaced by 1, the tag is on. If b is replaced by 0 the tag is off. Tag numeration order is given in Table 2. GalileoSky protocol tags.
Explanation	Main packet configuring.
Example	*Request: MainPack 111111111111111111110000* *Reply: MainPack=00000000000000000000111111111111111111110000b* *This means that tags 1, 2, 3, 4 are off and tags 5-26 inclusive are on. All the following tags are off.*

Command format **MainPack2 bbbbbbbbbbbbbb**

Parameters	**bbbbbbbbbbbbbb** – tag set from 129 to 256. If b is replaced by 1, the tag is on. If b is replaced by 0 the tag is off. Tag numeration order is given in Table 2. GalileoSky protocol tags.
Explanation	Main packet configuring.
Example	*Request: MainPack2 110000* *Reply: MainPack2=110000b* *This means that tags 129, 130, 131, 132 are off and tags 133 and 134 are on. All the following tags are off.*

Command format	**MainPackBit index,value**
Parameters	**index** –tag number, which is on or off for transmission to the server **value** – 1 if this tag should be transmitted to the server 0 if this tag should not be transmitted to the server Tag numeration order is given in Table 2. GalileoSky protocol tags.
Explanation	Main packet configuring.
Example	*Initially the second tag is off:* *MainPack= 1100b* *Switch on this tag.* *Request: MainPackBit 2,1* *Reply: MainPack= 1110b*

Command format	**DataKey key**
Parameters	**Key** – data encryption key in hexadecimal form, if it is equal to 0, data are not encoded.
Explanation	Specifies the key that encrypts the transmitted data.

10.4 Track parameters setting

Command format	**Turning V,A,D,S,dS**
Parameters	**V** – minimum speed that enables drawing of the track on the corners, [km/h]; **A** – minimum turn angle for Terminal to record a track point, [º]; **D** – the distance above which the next packet will be saved to the Terminal memory, [m]; **S** –the speed above which for dS-multiple amount track point will be recorded, [km/h]; **dS** – speeding interval, [km/h].
Explanation	Configures track detail representation.
Example	Request*: Turning 3,10,300,60,20* *Reply:* TURNING:Speed=3,Angle=10,Distance=300,SpeedEx=60,SpeedDelta=20;

Command format	**WrPeriod x,y**
Parameters	**x** – Period of packet recording in memory in motion, [sec.]; **y** – Period of packet recording in memory when the vehicle stops, [sec.].
Explanation	Period of packets recording when the vehicle is moving or when it stops.
Example	Request: WrPeriod 60,180 *Reply*: WRPERIOD move=60 parking=180

Command format	**GPS.Correct OnOff,MaxWrong,HDOP,Spd,Acc,Jump,TravelSpeed**
Parameters	**OnOff** – coordinates filtering is on(1) or off(0); **MaxWrong** – the number of wrong coordinates to be filtered (the recommended number is 5). This parameter accounts errors of acceleration exceed and jump, for other parameters the coordinates are always filtered; **HDOP** – Maximum HDOP above which the coordinates are not updated; **Spd** – Maximum speed. When it is exceeded, coordinates are considered false and are not updated, [km/h]; **Acc** – GPS or GLONASS data based acceleration;, [m/s²]; **Jump** – Maximum coordinate jump in the nearest 2 seconds, [m]; **TravelSpeed** – Minimum speed for coordinates to be updated, [km/h]. This function is not suitable for low speed vehicles (tractors, asphalt placing machines)
Explanation	Allows filtering false coordinates: (jumps when the vehicle stops, in or out of tunnels, near high-rise buildings).

Example	Request: GPS.CORRECT 1,5,2,150,3,50,3 *Reply*: GPS.correct: OnOff=1, MaxWrong=5, MaxHDOP=2, MaxSpd=150, MaxAcc=3, MaxJump=50, MaxTravelSpeed=3;

Command format	**GPS.Correct2 MaxNoSatTime,MinSatStart,MinSatWork**
Parameters	**MaxNoSatTime** – maximum time without satellite connection when no disconnection is registered, [sec.]; **MinSatStart** – minimum number of satellites to be connected to when the Terminal is on; **MinSatWork**– minimum number of satellites during operation of the Terminal. If the number is smaller, a disconnection will be registered.
Explanation	These settings affect coordinates updating, if filtering is on by **GPS.Correct** command.
Example	Request: GPS.CORRECT2 10,5,4 Reply: GPS.correct2:MaxNoSatTime=10,MinSatStart=4,MinSatWork=3;

Command format	**AccSens Sens,TO**
Parameters	**Sens** – accelerometer sensitivity. **TO** – the time after the vehicle stops, during which coordinates are updated, [sec].
Explanation	This function allows avoiding unnecessary outliers after the vehicle stops. Default value is 40,300. Sens value equal to 600 is 1g (g –gravitational acceleration)
Example	*Request: AccSens 40,300* *Reply: Accelerometer sensitive: sens = 40,time out=300*

Command format	**Ignition N**
Parameters	**N** – an input used as an ignition sensor: 0 – ignition sensor is not used; 1 – input 0 is used as ignition sensor; 2 – Input 1 is used as ignition sensor; 3 – Input 2 is used as ignition sensor; 4 – Input 3 is used as ignition sensor; 5 – input 4 is used as ignition sensor; 6 – input 5 is used as ignition sensor.
Explanation	If there is no response for a given input, vehicle is considered to be not started, and coordinates are not updated. It allows avoiding outliers after the vehicle stops. Triggering on input is determined by the limits set by InCfg command (section Analog-discrete inputs settings).
Example	*Request: Ignition1* *Reply: IGNITION:1;*

Command format	**Shock Mode,Angle,Timeout,ShockSens**
Parameters	**Mode** – strike determination mode: 0 – strike determination is switched off; 1 – strike determination is switched on, X axis is in vertical position; 2 – strike determination is switched on, Y axis is in vertical position; 3 – strike determination is switched on, Z axis is in vertical position; **Angle** – maximum incline angle [0º-180º], value equal to 180 switches off incline determination; **Timeout** – maximum allowable time when incline angle is exceeded, [sec.]. **ShockSens** – maximum acceleration by exceed of which a strike is detected. 600 points – gravitational acceleration.
Explanation	Switching on strike and incline determination mode.
Example	*Request: Shock 3,30,5* *Reply: Shock: Mode=3,MaxAngle=30,RT=5;*

Command format	**Mhours LoLevel,HiLevel**
Parameters	**LoLevel** – input voltage + supply voltage by stopped engine, [mV]; **HiLevel** – input voltage +supply voltage by started engine, [mV];
Explanation	Allows filtering false coordinates after the vehicle stops.
Example	*Request: mHours 12000,14500* *Reply: Mclock: lolevel=12000,hilevel=14500;*

10.5 Geofences settings

Command format	**Dzone Mode**
Parameters	**Mode** – operation mode inside a geofence: 0 – geofence processing is switched off; 1 – coordinates updating prohibition inside a geofence; 2 – GSM unit switching off inside a geofence, 3 – updating prohibition and GSM unit switching off at the same time.
Explanation	Allows setting of terminal behavior inside a geofence.
Example	Request: Dzone 3 Reply: Dzone:3;

Command format	**DzoneAdd Lat,Lon,R**
Parameters	**Lat** – geofence centre latitude; **Lon** – geofence centre longitude; **R** – geofence radius in meters.
Explanation	Allows adding a geofence. Each geofence is a circle with the determined center and radius.
Example	Request: DzoneAdd 55.9999,66.123456,100 Reply: DzoneAdd:lat=55.9999,lon=66.123456,rad=100;

Command format	**DzoneDel Lat,Lon**
Parameters	**Lat** – geofence center latitude; **Lon** – geofence center longitude.
Explanation	Allows deleting the geofence, set by its center coordinates.
Example	Request: DzoneDel55.9999,66.123456 Reply: DzoneDel:lat-55.9999,lon=66.123456;

Command format	**DzoneClear**
Parameters	This parameter deletes all geofences.
Example	Request: DzoneClear Reply: Dead zones are cleared

Command format	**DzoneCount**
Parameters	This parameter allows you getting the number of all geofences set in the Terminal.
Example	Request: DzoneCount Reply: DZONECOUNT:2;

Command format	**DzoneInfo N**
Parameters	**N** – Ordinal number of geofence beginning with 0.
Explanation	This parameter gives an access to the geofence's data.
Example	Request: DzoneInfo 0 Reply: DZONEINFO:Lat=10.000000,Lon=20.000000,Rad=30;

10.6 Information commands

Command format **Status**

Parameters	Allows finding device status at the moment of sending a command Dev – this device number; Soft – current firmware version; Pack – last recorded serial packet number; TmDt – Current time and date; Per – Current packet saving period (different when the vehicle is moving or stops); Nav – Coordinates determination accuracy. 0 – coordinates are found. Lat – Latitude; Lon – Longitude; Speed – Linear speed (vehicle speed); HDOP – Horizontal accuracy (The closer to 1, the better); SatCnt – Number of available satellites; A – movement directional angle
Example	Request: Status Reply:Dev50 Soft=91 Pack=17230 TmDt=10:58:6 20.6.9 Per=60 Nav=0 Lat=60.4007 Lon=31.0070 Speed=0.0194 HDOP=0.88 SatCnt=10 A=27.55

Command format **imei**

Parameters	Allows obtaining a unique GSM unit identifier,15byte
Example	Request: IMEI Reply: IMEI 123456789012345

Command format **imsi**

Parameters	Allows obtaining a unique IMSI identifier of the SIM-card
Example	Request: IMSI Reply: IMSI 123456789012345

Command format **inall**

Parameters	Allows analog input values in0..in5 as well as digital fuel level sensor values and temperature, and accelerometer values with respect to three axes (10bit for each axis starting with the zero bit) being obtained.
Example	Request: inall Reply: INALL:in0=0,in1=0,in2=0,in3=0,in4=0,in5=0,Acc=332943891;

Command format **Insys**

Parameters	Allows obtaining external source voltage, internal battery voltage, GPS aerial voltage, the main power bus voltage and also the temperature inside the Terminal.
Example	Request: insys Reply: INSYS: Pow=12438,Vbat=4196,Vant=2921,Vdc=4115,Temper=37

Command format **RS485**

Parameters	Allows you to receive a value of the digital fuel level sensor connected on the RS485 interface. For each FLS two values are available – level and temperature.
Example	Request: RS485 Reply: RS485 100,0;100,1;100,2;100,3;100,4;100,5;100,6;100,7;100,8;100,9;100,10; 100,11;100,12;100,13;100,14;100,15;

Command format	**Temex0**
Parameters	Allows finding temperature from the first four external DS18S20 thermometers. Format: the lower byte is the thermometer identifier; the higher byte is the temperature itself. To calculate the temperature the obtained value must be divided by 256 and rounded off to the whole number, with the fractional part deleted.
Example	Request: temex0 Reply: TemEx0: DS0=0,DS1=0,DS2=0,DS3=0

Command format	**Temex1**
Parameters	Allows finding temperature of the second four external DS18S20 thermometers. Format: the lower byte is the thermometer identifier; the higher byte is the temperature itself. To calculate the temperature the obtained value must be divided by 256 and rounded off to the whole number, with the fractional part deleted.
Example	Request: temex1 Reply: TemEx1: DS4=0,DS5=0,DS6=0,DS7=0

Command format	**Hum0**
Parameters	Allows finding the temperature of the first four DS1923 humidity sensors. ID – sensor identifier; T – temperature in Celsius degrees H – humidity in %.
Example	Request: Hum0 Reply: Hum0:ID0=1,T0=20,H0=20.0,ID1=2,T1=30,H1=30.0,ID2=3,T2=25,H2=40.0,ID3=5, T3=15,H3=50.0;

Command format	**Hum1**
Parameters	Allows finding the temperature of the second four DS1923 humidity sensors. ID – sensor identifier; T – temperature in Celsius degrees H – humidity in %.
Example	Request: Hum1 Reply: Hum1:ID4=1,T4=20,H4=20.0,ID5=2,T5=30,H5=30.0,ID6=3,T6=25,H6=40.0,ID7=5, T7=15,H7=50.0;

Command format	**Canibut**
Parameters	Allows current CAN bus state (Table 2. GalileoSky protocol tags) and iButton decimal value being obtained.
Example	Request: canib Reply: CAN_Ib: CANA0=0,CANA1=0,CANB0=0,CANB1=0,iBut=0

Command format	**statall**
Parameters	Allows obtaining device, inputs, outputs decimal status (Table 3. Device status field explanation) and mileage according to GPS/GLONASS data.
Example	Request:statall Reply: StatAll: Dev=1,Ins=2,Outs=7,Mileage=152;

Command format	**AccType**
Parameters	Allows obtaining accelerometer type. Returns "analog" for analog type and "digital" for digital type.
Example	Request: AccType Reply: AccType: digital

Command format **LastCmd N**

Parameters	N- number of recorded command, beginning from 0
Explanation	Allows overlooking the archive of the last executed commands. Returns the command source, time, date and text of the command.
Example	Request: lastcmd 2 Reply: USB 095659 20140305 ACTIVECAN 1

10.7 Service commands

Command format **PIN N**

Parameters	**N** – four-digit PIN-code of a SIM card.
Explanation	SIM card PIN-code and password setting for access settings in the Configurator. The default PIN-code is 0. If you enter the wrong code, the Terminal will be blocked for 25 seconds, and then reset. PIN-code is identical for both SIM-cards.
Example	Request: PIN 1234 Reply: PIN:1234;

Command format **Archive type**

Parameters	**type** – data source for sending to the server: 0 – archive from the internal flash-memory; 1 – archive from the microSD card.
Explanation	Selection of data source for sending to the server. After command execution it is necessary to reset the Terminal. Before you select a microSD card, delete the archive created by earlier firmwares (EraseTrackSD or delete the file from Track catalogue through the Card-Reader).
Example	Request: ARCHIVE 0 Reply: ARCHIVE:0;

Command format **FLASHARCHIVE Dynamic,SendOrder**

Parameters	**Dynamic** – whether the dynamic archive structure is used or not: 0 – the dynamic archive structure is off, all possible data are saved in archive; 1 – the dynamic archive structure is on, only the data selected to be transmitted to the server are saved in archive. **SendOrder** – order of data transmission: 0 – the data are sent deep into the archives; the most current data are sent first, then the oldest ones. 1 – the data are sent in chronological order
Explanation	Archive structure setting and the setting of the data transmission order to the server
Example	Request: FLASHARCHIVE 1,1Reply: FLASHARCHIVE:Dynamic=1,StraightSendOrder=1;

Command format **EraseCfg**

Explanation	Setting default configuration.
Example	Request: EraseCfg Reply: ERASECFG

Command format **EraseTrack**

Explanation	Deleting all tracks from the memory.
Example	Request: EraseTrack Reply: ERASETRACK

Command format	**EraseTrackSD**
Explanation	Deleting all tracks from the SD memory
Example	Request: EraseTrackSD Reply: ERASETRACKSD

Command format	**ColdStart**
Explanation	GLONASS unit cold start.
Example	Request: ColdStart Reply: GLONASS cold start

Command format	**Reset**
Explanation	Allows resetting the device remotely.
Example	Request: Reset Reply: Reset of device. Please wait 15 seconds…

Command format	**Upgrade**
Explanation	Firmware upgrading up to the specified one.
Example	Request: Upgrade 47 Reply: UPGRADE 47

Command format	**SleepMode OffOnStop,DST,GNSS,GPRS,ADC,CAN,0,RS485,SD,WakeUp,ST**
Parameters	**OffOnStop** – 0 – do not turn off GPS\GLONASS unit at a stop; 1 – turn off GPS\GLONASS unit at a stop. **DST** – Time spent at a stop, after which the Terminal will switch to the deep sleep mode; **GNSS** – turn off GPS\GLONASS unit in the deep sleep mode; **GPRS** –turn off GSM unit in the deep sleep mode; **ADC** – reduce ADC sampling rate in the deep sleep mode; the maximum frequency that can be measured at inputs is reduced by 2 and the minimum impulse period that can be registered increases twofold; **CAN** – turn off the CAN in the deep sleep mode; **RS485** – turn off RS485 in the deep sleep mode; **microSD** – turn off the microSD card in the deep sleep mode, the reading of trusted iButton keys is supported; **WakeUp** – a period in seconds between connections to a server ; **ST** – a length of connection to a server in deep sleep mode.
Explanation	Power saving modes control. In the deep sleep mode no 1Wire sensors sampling and no battery charging are performed.
Example	Request: SLEEPMODE 1,60,1,1,1,1,0,1,1,3600,600 Reply: SLEEPMODE:OffGNSSOnStop=1,DSTimeout=60, GNSS=1,GPRS=1,ADC=1,CAN=1,RS232=0,RS485=1,SD=1;GSMWakeUp=3600, SessionLen=60.

Command format	**RemoteConfig OnOff**
Parameters	**OnOff** – turns on the remote configuration function: 0 – remote configuration is off; 1 – remote configuration is on.
Explanation	Turns on and off the remote configuration (See section Remote configuration).
Example	Request: RemoteConfig 1 Reply: REMOTECONFIG:1;

10.8 Voice communication settings

Command format	**GSMVolume k,m**
Parameters	**k** – GSM-channel sound gain [1÷100]. **m** – GSM-channel microphone gain [1÷15]. The greater the parameter, the greater the gain.
Explanation	Allows speakerphone sound gain parameters being customized.
Example	Request: GSMVolume 75,15 Reply: GSMVOLUME=75,15

Command format	**AutoAnswer n**
Parameters	**n** – the number of calls before autoanswer. [0÷10] If the parameter is equal to 0, the function is off.
Explanation	Incoming call results in a terminal automatic answer.
Example	Request: AutoAnswer 1 Reply: AUTOANSWER=1

Command format	**Calls N**
Parameters	**N** – the number of call attempts
Example	Request: Calls 3 Reply: CALLS:3;

Command format	**RingTo N**
Parameters	**N** – a telephone number
Explanation	Making a call from the Terminal to the given telephone number.
Example	Request: RingTo 89119988899 Reply: RINGTO=89119988899

Command format	**SendSMS Tel,Msg**
Parameters	**Tel** – a telephone number to which SMS is sent **Msg** – SMS template. It may contain parameters to insert current data: %IMEI – terminal`s IMEI, %LAT – latitude, %LON – longitude.
Explanation	Sending SMS to the given telephone number.
Example	Request: SendSMS 89119988899,Test Reply: SMS sheduled

10.9 Analog-discrete inputs setting

Command format	**InCfg_num_in ft,fl,up_low,up_hi,down_low,down_hi,imp_null**
Parameters	**num_in** – an input number, beginning from 0; **ft** – filter type 0 – mean value computation; 1 – pulse count; 2 – frequency count 3 – pulse count from two synchronously connected sensors. **fl** – filter length [1÷50]. It is used for average and discrete signal function; **up_low** – lower limit of a discrete signal triggering, [mV]; **up_hi** – upper limit of a discrete signal triggering, [mV]; **down_low** – lower limit of a discrete signal failure, [mV]; **down_hi** – upper limit of a discrete signal failure, [mV]; **imp_null** – pulses counter behavior: 1 – counter is set to zero, 0 – counter continues operation.
Explanation	Allows one of 8 analog/discrete inputs being configured.

Example	Request: InCfg0 0,10,8000,15000,0,3000,0 Reply: INCFG0:FiltType=0,FiltLen=10,UpLow=8000,UpHi=15000,DownLow=0,DownHi=3000,ImpNull=0;

Command format **PowInCfg fl,up_low,up_hi,down_low,down_hi**

Parameters	**fl** – average length of the filter [1÷50]; **up_low** – lower limit of a discrete signal triggering, [mV]; **up_hi** – upper limit of a discrete signal triggering, [mV]; **down_low** – lower limit of a discrete signal failure, [mV]; **down_hi** – upper limit of a discrete signal failure, [mV];
Explanation	Allows configuring the operating limits for the external power input.
Example	Request: PowInCfg 10,8000,15000,0,3000 Reply: POWINCFG:FiltLen=10,UpLow=8000,UpHi=15000,DownLow=0,DownHi=3000.

Command format **AccVal**

Explanation	Obtaining filtered accelerometer mean-square value by three axes. Accelerometer sensitivity: min = 555mV/g; average = 600mV/g; max = 645mV/g; Where g is gravitational acceleration ($g \approx 9.8 m/s^2$).
Example	Request: AccVal Reply: ACCVAL = 625 --- AccVal = 0.625B. As you can see, the accelerometer is affected only by the gravity force.

10.10Transistor outputs setting

Command format **Out v,s**

Parameters	**v** – output ordinal number (starting with the zero); **s** – Desired state (0 – on-state transistor output; 1 –off-state transistor output).
Explanation	Transistor output control. With one output is being controlled, the others outputs' state remains unchanged. Transistor outputs are off by default.
Example	Request: Out 1,1 Reply: OUT(3..0) = 0010 As you can see all outputs except 1 are on.

10.11Autoinformer setting

Command format	**Autoinformer OnOff,Repeat,Out,FileName**
Parameters	**OnOff** – enable/disable Autoinformer function: 1 – the function is enabled, 0 – the black box function is enabled (the navigation data are duplicated and saved to the external micro-SD card). **Repeat** – determines whether the file should be replayed when the device is in the playback zone. If the value is 0, the file is played only once on entering the zone. **FileName** – a route name. The route is understood as the number of zones to be announced.
Explanation	For more information see section Autoinformer.
Example	Request: Autoinformer 1,0,0,Marshrut 1 Reply: AUTOINFORMER:OnOff=1,Repeat=0,Out=0,Rout=Marshrut 1;.

10.12Digital inputs settings

Command format	**RS485FN nf**
Parameters	**nf** – function number: **0 –** fuel level sensors , GalileoSky photo camera (of old design);ДБГ-С11Д dosimeter **1** – RFID reader MATRIX 5; **2 -** fuel level sensors , GalileoSky photo camera (current series tool);ДБГ-С11Д dosimeter.
Explanation	RS485 port settings.
Example	Request: RS485FN 1 Reply: RS485FN: 1;

Command format	**iButtons ib1,ib2,ib3,ib4,ib5,ib6,ib7,ib8**
Parameters	**ib1-ib8** – four lower bytes of iButton identification hexadecimal number without the checksum. For example, full key hexadecimal number: 09 00 00 00 91 02 0C 5C, where 09 – type of device (in this case, it is DS1982, for DS1990 - 01), 00 00 00 91 02 0C – unique number, 5C – the checksum. In this case, 00 91 02 2C must be entered.
Explanation	List of iButton identifiers, the connection state of which is monitored by the terminal.
Example	Request: iButtons 0091022C,0,0,0,0,0,0,0 Reply: IBUTTONS:0091022C,0,0,0,0,0,0,0;

Command format	**AddKey key1,…,key25**
Parameters	**key** – the lower 4 bytes of the iButton identification number excluding the checksum in hexadecimal form. For example, the full key number in hexadecimal form is: 09 00 00 00 91 02 0C 5C, where 09 – the type of device (in this case, it is DS1982, for DS1990 - 01), 00 00 00 91 02 0C – the unique number, 5C – the checksum. In this case, the number to be entered is 00 91 02 2C. The command can contain a list of up to 25 keys.
Explanation	To add a key to the list of trusted iButton identifiers on a micro-SD-card.

Example	Request: AddKey 0091022C,0091022D Reply: Added 2 keys

Command format	**DelKey key1,…,key25**
Parameters	**key** – the lower 4 bytes of the iButton identification number excluding the checksum in hexadecimal form. For example, the full key number in hexadecimal form is: 09 00 00 00 91 02 0C 5C, where 09 – the type of device (in this case, it is DS1982, for DS1990 - 01), 00 00 00 91 02 0C – the unique number, 5C – the checksum. In this case, the number to be entered is 00 91 02 2C. The command can contain a list of up to 25 keys.
Explanation	To remove a key from the list of trusted iButton identifiers on a micro-SD-card.
Example	Request: DelKey 0091022C,0091022D Reply: Deleted 2 keys

Command format	**KeyCount**
Explanation	The number of trusted iButton keys on a micro-SD card.
Example	Request: KeyCount Reply: KEYCOUNT:12;

Command format	**ShowKey N**
Parameters	**N** – The order number of an iButton key in the list on a micro-SD-card. Numbering starting with 1.
Explanation	To show an identifier of a trusted iButton key on a micro-SD-card.
Example	Request: ShowKey 1 Reply: SHOWKEY 1:9503276 (0x0091022C)

10.13Signaling mode setting

Command format **SIGN GWTime,DropAlarmTimeout, UseIB**

Parameters	**GWTime** – duration of the "green wave" which is the time after the signalling starts during which no sampling of sensors takes place, [sec]; **DropAlarmTimeout –** time in the alarm mode, after which an automatic switching to the alarm mode is performed. By zero, the Terminal will stay in the signalling mode until the command is sent or until it is switched off using the input, [sec]; **UseIB –** should iButton keys be used for arming and disarming: 0 – no; 1 – arming and disarming through the short-time put of one of the trusted iButton keys; 2 – arming only having one of the trusted iButton keys, if no key is put, the Terminal is disarmed; 3 – arming only having any of the iButton keys, if no key is put, the Terminal is disarmed. 4 – disarming only having any of the iButton keys, if no key is put, the Terminal is armed; 5 – arming through the short-time put of one of the trusted iButton keys, no disarming after disconnecting the key. 6- arming if any iButton key is put. After disconnecting the key the Terminal is armed.
Explanation	General configurations of signalling.
Example	Request: SIGN 40,60,0 Reply: SIGN:GWTime=40,DropAlarmTimeout=60 ,UseIB=0;

Command format **S**

Explanation	Arming.
Example	Request: S Reply: Signaling is enabling

Command format **DS**

Explanation	Disarming.
Example	Request: DS Reply: Signaling is disabling

Command format **ST**

Explanation	Signaling status. Possible states: Signaling is disabled – signaling is off, Signaling is enabled – signaling is on, Alarm – alarm mode.
Example	Request: ST Reply: Signaling is disabled

Command format **AddSigPhone phone[,n]**

Parameters	**phone** – a phone number **n** – an optional parameter, added phone number index.
Explanation	Notification phone setting
Example	Request: AddSigPhone 123456789 Reply: SignPhones 123456789;;;;

Command format	**SIN0 type,delay,sms,ring,photo,msg**
Parameters	**type** – an input mode: • 0 – is not used for signaling; • 1 – input activation results in signaling mode on; • 2 – input activation results in alert mode on if signaling mode is on; • 3 – input activation results in alert mode on even if signaling mode is off. **delay** – post-activation delay before switching to alert mode, [sec]. **sms** – enable SMS notification: 1 – yes, 0 – no **ring** – enable phone call notification: 1 – yes, 0 – no **photo** – take photo: 1 – yes, 0 – no **msg** – alert mode message. The message may contain the parameters, which are replaced by the current data: %IMEI – IMEI of the terminal, %LAT – latitude, %LON – longitude.
Explanation	Setting the behavior of an input in signaling mode.
Example	Request: SIN0 3,0,1,1,0,Alarm %IMEI Reply: SIN0:SignType=3,Adelay=0, SMS=1,Ring=1,Photo=0,Msg=Alarm %IMEI;

sin1, sin2, sin3, sin4, sin5, sin6, sin7 commands are similar to sin0.

Command format	**SGPS type,speed,r,t,sms,ring**
Parameters	**type** – operating mode: • 0 – is not used for signaling; • 1 – alert mode when the specified speed is exceeded; • 2 – alert mode if the vehicle is beyond the radius longer than a predetermined time interval; • 3 – switching to alert mode when the speed is exceeded or if the vehicle is beyond the radius longer than a predetermined time interval. **speed** – maximum speed, [km/h]. **r** – maximum radius, [m]. **t** – maximum time interval staying beyond the radius, [s]. **sms** – enables SMS notification: 1 – yes, 0 – no **ring** – enables phone call notification: 1 – yes, 0 – no
Explanation	Setting of the use of GPS data in signaling mode
Example	Request: sgps 1,10,1,10,1,1 Reply: SGPS:SignType=1,Speed=10,R=1,T=10,SMS=0,Ring=0;

Command format	**SACC type,sms,ring,photo,msg**
Parameters	**type** – operating mode: • 0 – is not used for signaling; • 1 – an incline more than the given angle results in Alarm in Signaling mode; • 2 –acceleration exceeding (strike) results in Alarm in Signaling mode; • 3 – both an incline and a strike result in Alarm in Signaling mode. **sms** – enables SMS notification: 1 – yes, 0 – no **ring** – enables phone call notification: 1 – yes, 0 – no **photo** – take photo: 1 – yes, 0 – no **msg** – alert mode message. The message may contain the parameters, which are replaced by the current data: %IMEI – IMEI of the terminal, %LAT – latitude, %LON – longitude.
Explanation	Setting of the use of accelerometer data in signaling mode. Operation thresholds are set by SHOCK command (section Determination of strike and incline)
Example	Request: SACC 2,1,1,0,Strike Reply: SACC:SignType=2,SMS=1,Ring=1,Photo=0,Msg=Strike;

Command format	**SOUT0 EMode,EImpT,EImpC,DMode,DImpT,DImpC,AMode,AImpT,AImpC,ADelay**
Parameters	**EMode** – output operating mode by arming: • 0 – no reaction, • 1 – output is inverted, • 2 – output generates pulses, **EImpT** – pulse time during Arming, msec. **EImpC** – number of pulses during Arming. **DMode** – output operating mode by Disarming: • 0 – no reaction; • 1 – output is inverted; • 2 – output generates pulses. **DImpT** – pulse time during Disarming, msec. **DImpC** – number of pulses during Disarming **AMode** – output mode by Alarm: • 0 – no reaction; • 1 – output is inverted; • 2 – output generates pulses. **AImpT** – impulse time during Alarm, msec **AImpC** – number of impulses during Alarm. **ADelay –** activation delay after Alarm mode is on, in sec. The Device rounds off pulse duration to 0.1 sec
Explanation	Setting the behavior of an output in signaling mode.
Example	Request: SOUT0 2,1,1,2,2,2,1,0,0,20 Reply: SOUT0:EMode=2,EImpT=1,EImpC=1,DMode=2,DImpT=2,DImpC=2,AMode=1, AImpT=0,AImpC=0, ADelay=20;

sout1, sout2, sout3 commands are similar to sout0.

10.14CAN settings

Command format	**CanRegime Mode,BaudRate,TimeOut, DoNotCleanAfterTimeOut**
Parameters	**Mode** – operating mode: • 0 – CAN-interface is off and is not used; • 1 – CAN-bus scanner; • 2 – standard FMS filter; • 3 – user filter29 bit; • 4 – user filter 11 bit **BaudRate** – data bus rate. It must be the same as the vehicle data bus rate. It can have the following values: from 10000 up to 500000. Typical valuations: 62500, 125000, 250000, 500000. **TimeOut** – measured in msec. For CAN_SCANER mode it is response latency. If it is too small, not all bus messages will be received. The recommended time for CAN_SCANER is 2000 msec. For all the rest modes it is time to receive at least one message otherwise the value will be set to zero. **DoNotCleanAfterTimeOut** – data should not be set to zero by disconnecting CAN-bus.
Explanation	General CAN-bus control.
Example	Example: switching on scanner for a 250000 b/sec bus with the message (answer) latency equal to 2 sec. Request: CanRegime 1,250000,2000 Reply: CANREG: Mode=1,BaudRate=250000,TimeOut=2000; DoNotCleanAfterTimeOut=0;

Command format	**ActiveCAN OnOff**
Parameters	**OnOff** – operating mode: 0 – passive mode: packets receiving confirmations are not sent to the CAN-bus. It is a safe mode of operation. It does not interfere with the on-board equipment; 1 – active mode: packets receiving confirmations are sent to the CAN-bus.
Explanation	Control of packets confirmation sending to the CAN-bus. Confirmation sending may be necessary by connection to the troubleshooting socket if the data cannot be read in passive mode.
Example	Request: ActiveCAN 1 Reply: ACTIVECAN:1;

Command format	**CAN8BitR0 ID,Shift**
Parameters	**ID** – captured bus identifier: **Shift** – useful data shift in the received packet
Explanation	Single CAN-tag content control.
Example	Request: Can8BitR0 419360256,1 Reply: CAN8BITR0:ID=419360256,Shift=1;

Commands: **CAN8BitR1, …, CAN8BitR30, CAN16BitR0, …, CAN16BitR14, CAN32BitR0, …, CAN32BitR14** are similar to CAN8BitR0 command.

10.15Packet transmission, energy saving, Stels mode settings

Command format: **Stels pday, phours, minutesGSMOn**
See section **Stels mode and packet data transmission**.

10.16Photo camera operation setting

Command format	**GetPhoto d,t,2**
Parameters	**d** – photo date, format DDMMYY, where DD – day, MM – month, YY – year; **t** – photo time, format HHMMSS, where HH – hours, MM – minutes, SS – seconds;
Explanation	Request to transmit the nearest to the given time and data photo to the server.

Example	Request: GetPhoto 050511,052030,0 Reply: Send of photo is scheduled

Command format **MakePhoto**

Explanation	Take a photo and send it to the server.
Example	Request: MakePhoto Reply: Photo ok

Command format **PhotoCfg t1,t2,mode,res,confirm**

Parameters	**t1** –periodical shooting interval, [sec]. Photos are saved only to the SD-card, 0 – shooting only by event; **t2** – shooting interval [sec]. Photos are saved to the SD-card and sent to the server, 0 – shooting only by event; **mode** – periodical shooting in geofences: 0 – photos are taken regardless of geofences; 1 – photos are taken only inside geofences; 2 – photos are taken only outside geofences. **res** – picture resolution: 0 – 640x480 points; 1 – 320x240 points. **confirm** – waiting for a confirmation of a picture reception from the server: 0 – do not wait; 1 – wait.
Explanation	Settings of a periodical camera shooting, picture format and image transfer protocol.
Example	Request: PhotoCfg 5,150,0,0,0 Reply: PHOTOCFG:WrPeriod=5,SendPeriod=150,Type=0,Size=0,Confirm=0;

Command format **CleanPhotoQueue**

Explanation	Mark all photos as sent ones.
Example	Request: CleanPhotoQueue Reply: Photo queue is cleaned

11 *Bootloader*

The processor program (firmware) is a set of algorithms developed by GalileoSky Ltd specialists. Owing to this program, the central processor receives the data from different system units, processes them logically and mathematically and takes decisions for control commands of controller units to be worked out depending on the situation.
Bootloader is a Terminal`s sub-programme allowing the main program part (hereinafter referred to as Firmware) being updated. The firmware can be downloaded from the official site www.7gis.com . The main program can be downloaded via the USB or GPRS channel in the Terminal.

11.1 USB channel download

1) Connect the Terminal to the external power supply;
2) Connect the USB cable; the device must be defined on the computer;
3) Launch the Configurator and open the Command mode tab;
4) Type in upgrade 0 command after which the Terminal will be reset in 15-20 sec;
5) After resetting the Terminal will enter the bootloader mode, and the device should be defined as the system storage device (flash-memory);
6) Download the right firmware version and extract firmware.bin file from the archive;
7) Copy the downloaded firmware.bin file to the flash-memory;
8) After reflashing the device will be reset and enter the operating mode in 15 seconds.

11.2 GPRS channel download

1) Connect the Terminal to the external power supply;
2) APN settings must conform to the inserted SIM card inserted in the Terminal, otherwise, the device flashing will not happen, and the Terminal will return to the operating mode;
   Give the following command: UPGRADE firmware№ using any of the available channels (SMS, GPRS, USB), where firmware№ is the necessary firmware version. UPGRADE 0 initiates downloading the latest firmware;
3) You may see if the flashing is in progress by LEDs blinking;
4) In 15-25 minutes (depending on connection conditions and GPRS terms of service by operator) upgrade will be completed and the Terminal will turn into operation mode automatically.

11.3 Using analog inputs to enter bootloader mode

After the device power supply is off, energize all analog-discrete inputs (section Contacts description) by applying the voltage of 7.0V ± 0.2V until the Terminal enters the bootloader mode. This function is used only during an improper device flashing. An improper firmware is the firmware designed for terminals with the other functional.

11.4 LED operation during reflashing.

Depending on the GSM modem and microcontroller units activation stages, the Terminal will go through the following stages:

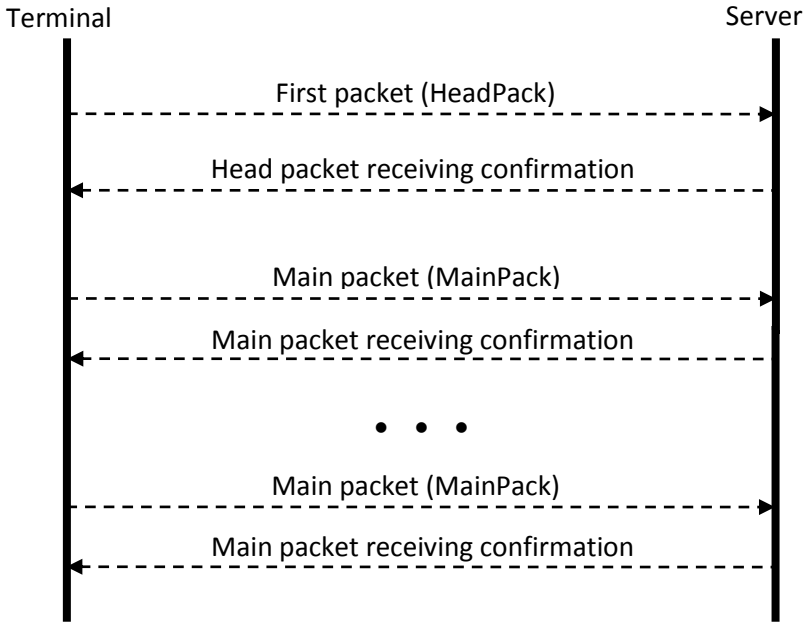
Yellow LED blinking, times	GSM Modem activation stage
6	Procedure of GSM unit activation was successful.
5	GPRS service registration was successfully.
4	Establishing firmware update connection to the server was successful.
3	The Terminal switched to downloading mode.
2	Server connection is not lost, and the Terminal is in downloading mode.
1	First request sending was successful.

Blue LED blinking: each successfully received and recorded packet is accompanied by a blue LED light change.

12 *Server exchange protocol*

This protocol supports bi-directional data exchange between the terminal and the server. The data are transmitted via GPRS channel with the use of TCP/IP protocol. The server must have static address and port for connecting terminals as clients.

Data transmission from the terminal to the server:



After establishing terminal-server connection the device sends head pack and then main packs with the data. Each pack needs confirmation from the server; if confirmation is not received, the terminal sends the pack once again.
Note that TCP/IP is a stream protocol, i. e there are no packets of the TCP/IP level for the application server software. Reading from the TPC/IP-socket is a reading of the bytes stream but not reading of the packets. The GalileoSky protocol packets are not ones of the application level, and for their correct parsing server software has to select a buffer and capture the packet. In no case, it is possible to rely on the fact that one read operation from the socket returns the whole GalileoSky protocol packet. The whole GalileoSky protocol packet can be received after executing some sequential read operations, there can be time intervals between them, it is connected with the operation aspects of the TCP/IP protocol.

Head pack structure:

Field	**Size**
Header 0x01	1 byte
Packet length	2 bytes
Tag 1	1 byte
Data, corresponding tag 1	depends on the tag type
…	
Tag N	1 byte
Data, corresponding tag N	depends on the tag type
Checksum	2 bytes

A high-order bit is an indicator of not transferred data in the archive, 15 low-order bits are the number of bytes in the packet.
Transmitted tags are set by HeadPack command. Packet length is calculated from the head tag to checksum beginning. Tags are in ascending order. The data and the checksum are transferred in little-endian format.

The Checksum is calculated for the whole packet including the header, length field and indicator of unsent data. The Checksum is calculated by CRC-16 Modbus algorithm, you can find an example of its realization on http://www.modbus.org/docs/Modbus_over_serial_line_V1_02.pdf.

Main pack structure is the same as the structure of the head pack. Transmitted tags are set by MainPack command. Main pack may transmit several records from the archive. First record tags go first, then the second record tag and etc.
The data may be coded; XTEA3 algorithm is used for coding (http://tomstdenis.tripod.com/xtea.pdf) with block length 128 bit, key length 256 bit and 32 rounds.
In this case, the header, length and the unsent data indicator stay unchanged, and archives records with the tags are coded. If the data length is not multiple to code block length, missing place is filled with zeros and then coded. The Checksum is calculated for coded data packet.

Field	Size
Header 0x02	1 byte
Received packet checksum	2 bytes

Table 1. Confirmation packet structure

Packet will be transmitted again if its checksum does not correspond to the checksum in confirmation packet.

№	Tag	Designation	Parameter	
			Length, byte	
1	0x01	Hardware version	1	Unsigned integer.
2	0x02	Firmware version	1	Unsigned integer.
3	0x03	IMEI	15	ASCII line.
4	0x04	Identifier of a device	2	Unsigned integer.
5	0x10	Number of an archive record	2	Unsigned integer.
6	0x20	Date and time	4	Unsigned integer, seconds since 1970-01-01 00:00:00 GMT.
7	0x30	Coordinates in degrees, number of satellites, indication of coordinates determination correctness	9	4 lower bits: number of satellites. The next 4 bits: coordinates determination correctness, 0 – coordinates are correct. The next 4 bytes: signed integer, latitude, the value should be divided by 1000000, negative values correspond to southern latitude. Last 4 bytes: signed integer, longitude, the value should be divided by 1000000, negative values correspond to western longitude. For example, received: 07 C0 0E 32 03 B8 D7 2D 05. Coordinates correctness: 0 (coordinates are correct). Satellites number: 7 Latitude: 53.612224 Longitude: 86.890424
8	0x33	Speed in km/h and direction in degrees	4	2 lower bytes: unsigned integer, speed, the value should be divided by 10. 2 higher bytes: unsigned integer, direction, the value should be divided by 10. For example, received: 5C 00 48 08. Speed: 9.2 km/h. Direction: 212 degrees.
9	0x34	Height, m	2	Signed integer.

№	Tag	Designation	Parameter	
			Length, byte	Length, byte
10	0x35	HDOP	1	Unsigned integer. The value should be divided by 10.
11	0x40	Status of device	2	Unsigned integer, each bit corresponds to a separate unit state, see explanations below.
12	0x41	Supply voltage, mV	2	Unsigned integer.
13	0x42	Battery voltage, mV	2	Unsigned integer.
14	0x43	Terminal temperature, °C	1	Signed integer.
15	0x44	Acceleration	4	10 lower bits: acceleration by X axis. Next 10 bits: acceleration by Y axis. Next 10 bits: acceleration by Z axis. 600 points correspond to free fall acceleration. Example, received: AF 21 98 15. Acceleration X: 431, Y: 520, Z: 345.
16	0x45	Status of outputs	2	Each bit, beginning with the lower one, indicates the state of a correspondent output.
17	0x46	Status of inputs	2	Each bit, beginning with the lower one, indicates triggering on a correspondent input.
18	0x50	Input voltage 0. Depending on settings: 1.voltage, mV, 2.number of pulses; 3.frequency,Hz.	2	Unsigned integer.
19	0x51	Input voltage 1. Depending on settings: 1.voltage, mV, 2.number of pulses; 3.frequency,Hz.	2	Unsigned integer.
20	0x52	Input voltage 2. Depending on settings: 1.voltage, mV, 2.number of pulses; 3.frequency,Hz.	2	Unsigned integer.
21	0x53	Input voltage 3. Depending on settings: 1.voltage, mV, 2.number of pulses; 3.frequency,Hz.	2	Unsigned integer.
24	0x70	Thermometer 0 identifier and measured temperature, °C	2	Lower byte: unsigned integer, identifier. Higher byte: signed integer, temperature. Example, received: 01 10 Identifier: 01 Temperature: 16ºC
25	0x71	Thermometer 1 identifier and measured temperature, °C	2	Analogous to temperature sensor 0.
26	0x72	Thermometer 2 identifier and measured temperature, °C	2	Analogous to temperature sensor 0.
27	0x73	Thermometer 3 identifier and measured temperature, °C	2	Analogous to temperature sensor 0.
28	0x74	Thermometer 4 identifier and measured temperature, °C	2	Analogous to temperature sensor 0.
29	0x75	Thermometer 5 identifier and measured temperature, °C	2	Analogous to temperature sensor 0.

№	Tag	Designation	Parameter	
			Length, byte	Length, byte
30	0x76	Thermometer 6 identifier and measured temperature, °C	2	Analogous to temperature sensor 0.
31	0x77	Thermometer 7 identifier and measured temperature, °C	2	Analogous to temperature sensor 0.
32	0x90	First iButton key identification number	4	
33	0xc0	CAN-bus data (CAN_A0). Fuel used by a vehicle from the date of manufacturing, l	4	Unsigned integer, the value should be divided by 2.
34	0xc1	CAN-bus data (CAN_A1). Fuel used by a vehicle from the date of manufacturing, l	4	Lower byte: fuel level, the value should be multiplied by 0.4. The second byte: coolant temperature, the value should be deducted 40. The third and fourth bytes: engine speed, values should be multiplied by 0.125. Example, received: FA 72 50 25. Fuel level: 100%. Temperature 74ºC. Engine speed: 1194 rmp.
35	0xc2	CAN-bus and CAN-LOG data (CAN_B0). Vehicle`s mileage, m.	4	Unsigned integer, the value should be multiplied by 5.
36	0xc3	CAN_B1	4	
37	0xc4	CAN8BITR0	1	
38	0xc5	CAN8BITR1	1	
39	0xc6	CAN8BITR2	1	
40	0xc7	CAN8BITR3	1	
41	0xc8	CAN8BITR4	1	
42	0xc9	CAN8BITR5	1	
43	0xca	CAN8BITR6	1	
44	0xcb	CAN8BITR7	1	
45	0xcc	CAN8BITR8	1	
46	0xcd	CAN8BITR9	1	
47	0xce	CAN8BITR10	1	
48	0xcf	CAN8BITR11	1	
49	0xd0	CAN8BITR12	1	
50	0xd1	CAN8BITR13	1	
51	0xd2	CAN8BITR14	1	
52	0xd3	The second iButton key identification number	4	
53	0xd4	Total mileage according to GPS/GLONASS units data, m.	4	Unsigned integer.
54	0xd5	State of iButton keys, identifiers of which are set by iButton command.	1	Each bit corresponds to one key. Example, received: 05 or 00000101 in binary system. It means that the first and the third keys are connected.
55	0xd6	Depending on settings: 1. CAN16BITR0 2. the 1st vehicle axle load, kg 3. OBD II failure code	2	In case the load is on axle, the value is an unsigned integer; values should be divided by 2.

№	Tag	Designation	Parameter	
			Length, byte	Length, byte
56	0xd7	Depending on settings: 1. CAN16BITR1 2. the 2nd vehicle axle load, kg 3. OBD II failure code	2	In case the load is on axle, the value is an unsigned integer; values should be divided by 2.
57	0xd8	Depending on settings: 1. CAN16BITR2 2. the 3rd vehicle axle load, kg 3. OBD II failure code	2	In case the load is axle, the value is an unsigned integer; values should be divided by 2.
58	0xd9	Depending on settings: 1. CAN16BITR3 2. the 4st vehicle axle load, kg 3. OBD II failure code	2	In case the load is on axle, the value is an unsigned integer; values should be divided by 2.
59	0xda	Depending on settings: 1. CAN16BITR4 2. the 5th vehicle axle load, kg 3. OBD II failure code	2	In case the load is on axle, the value is an unsigned integer; values should be divided by 2.
60	0xdb	Depending on settings: 1. CAN32BITR0 2. total time of engine operation, h	4	In case the time of engine operation is transmitted, the value is an unsigned integer; values should be divided by 100.
61	0xdc	CAN32BITR1	4	
62	0xdd	CAN32BITR2	4	
63	0xde	CAN32BITR3	4	
64	0xdf	CAN32BITR4	4	
65	0x54	Input 4 values. Depending on settings: 1.voltage, mV, 2.number of impulses; 3.frequency,Hz.	2	Unsigned integer.
66	0x55	Input 5 values. Depending on settings: 1.voltage, mV, 2.number of pulses; 3.frequency,Hz.	2	Unsigned integer.
95	0x8A	Temperature from fuel level sensors connected to RS485 port with address 0, °C.	1	Signed integer
96	0x8B	Temperature from fuel level sensors connected to RS485 port with address 1, °C.	1	Signed integer
97	0x8C	Temperature from fuel level sensors connected to RS485 port with address 2, °C.	1	Signed integer
129	0xA0	CAN8BITR15	1	Accessible only by a dynamic archive structure
Tags CAN8BITR16 – CAN8BITR29 (0xA1-0xAE) are similar to CAN8BITR16 with numbers 130-143				
144	0xAF	CAN8BITR30	1	Accessible only in the dynamic archive structure

№	Tag	Designation	Parameter	
			Length, byte	
145	0xB0	CAN16BITR5	2	Accessible only in the dynamic archive structure
Tags CAN16BITR6 – CAN32BITR13 (0xB1-0xB8) similar to CAN16BITR5 with numbers 146-153				
154	0xB9	CAN16BITR14	2	Accessible only in the dynamic archive structure
161	0xF0	CAN32BITR5	4	Accessible only in the dynamic archive structure
Tags CAN32BITR6 – CAN32BITR13 (0xF1-0xF8)are similar to CAN32BITR5 with numbers 162-169				
170	0xF9	CAN32BITR14	4	Accessible only in the dynamic archive structure
174	0x47	EcoDrive and driving style determination	4	Accessible only in the dynamic archive structure. Unsigned integer. Lower byte: acceleration. The second byte: braking. The third byte: cornering acceleration. The fourth byte: strike on bumps. All accelerations are expressed in standard units, 100 = 1g = 9,8 m/s2
176	0x5D	ДБГ-С11Д dosimeter data	3	2 lower bytes: ADER, 3V/h, unsigned integer, (xxxxxxyy yyyyyyyy – x-order, y – floating-point coefficient). Higher byte: dosimeter state. Bit 0-2: dose power and its indeterminacy value: 000 –weighted average value is typed out via 2 channels 001 –channel 1 value is typed out 010 – channel 2 value is typed out 101 – false value is typed out (device in testing mode) Bit 3 – channel 1 state: 0 – is off, 1 – is on. Bit 4: channel 1 state: 0 – OK, 1 – failure. Bit 5: channel 2 state: 0 – is off, 1 – is on. Bit 6: channel 2 state: 0 - OK, 1 - failure. Bit 7: economy mode: 0 –is off, 1 – is on.

Table 2. GalileoSky protocol tag

Bit number	Field explanation
0	0 – vibration level corresponds to parking; 1 – to driving (set by AccSens command).
1	0 – incline angle does not exceed the allowable one; 1 – incline level exceeds the allowable one.
2	0 – None of the trusted iButton keys are connected, 1- one of the recorded to the microSD-card iButton keys is connected.
3	0 – there is a SIM card, 1 – GSM modem can't determine the SIM-card.
4	0 – terminal is outside the geofence, 1 - terminal is inside the geofence.
5	0 – voltage of internal source is normal; 1 – lower than 3.7 V.
6	0 – GPS aerial is connected; 1 – disconnected.
7	0 – voltage of internal Terminal bus supply is normal, 1 – declined from normal.
8	0 – external supply voltage is normal, 1 - declined from normal (set by powincfg command).
9	0 – vehicle is stopped; 1 – vehicle is started (set by mhours command).
10	0 – vibration level corresponds to the normal movement, 1 – vibration level corresponds to a strike.
11	0 – GPS operates; 1 – GLONASS unit operates.
12	Signal quality, range: [0-3]. The less value, the worse communication.
13	
14	0 – signaling mode is off; 1 – on.
15	0 – no alarm; 1 – alarm activated.

Table 3. Device status field explanation

Example1.
The Terminal should be configured so that the head pack (HeadPack) contains information about the Terminal version (HardVersion), firmware version (SoftVersion), unique 15-digit GSM unit identifier(IMEI), Terminal user ID (ID device).
Correspondent tag mask: 00000000000000000000000000001111.
To apply the settings we should use the following command
HeadPack 00000000000000000000000000001111, or omitting zeros, HeadPack 1111

Example2.
It is necessary to configure the main packet (sent in normal mode) so that the Terminal user ID (ID device), packet number (NumberOfPacket), date and time of packet record (TimeDate), coordinates are sent.

Correspondent tag mask: 00000000000000000000000001111000

To apply the settings we should use the command: MainPack 1111000.
In this case, we have been omitted the zeros at once.

The server can send commands to the device. After command receiving and its successful execution, the terminal sends a packet with text reply.

Structure of a packet with a command:

Field	**Size**
Header 0x01	1 byte
Packet length	2 bytes
Tag 0x03	1 byte
IMEI	15 bytes
Tag 0x04	1 byte
Device identifier	2 bytes
Tag 0xE0	1 byte
Command number, random number selected by the server	4 bytes
Tag 0xE1	1 byte
Command line length	1 byte
Command text in ASCII	
Checksum. Calculated for the whole packet beginning with the header.	2 bytes

Respond's structure is analogous to the command's packet, but reply text is sent instead of command text.

13 *Additional information*

1. Certifying

The Terminal is certified to comply with GOST R.

2. Warranty

GalileoSky Ltd hereby guarantees the realization of consumers' rights provided by the local laws throughout Russia and the CIS.
GalileoSky Ltd guarantees the operability of the terminal subject to compliance with the instructions set out in the above user`s manual.

2.1. Warranty conditions

The warranty period is – 24 months since the day of purchase.
Note: a defective terminal (with cracks and fissures, dents and impact marks and etc.) due to consumer's fault resulting from inappropriate maintenance, storage and transportation is not liable to warranty. The above also holds for a device without the body or battery.
In case the guarantee document proving the device sale to the customer does not contain the date of purchase, the name and seller's seal the warranty period starts since the day of production.
The consumer has the right for free maintenance in the manufacturer's service center if a production or design defect appeared during the warranty period. The consumer has the right for maintenance during the whole period of operation of the device. The consumer has all the other rights provided by the laws of the Russian Federation and the CIS.
If the failure cause cannot be found at the moment of appeal, a technical examination is held, which cannot exceed 30 days since the moment of appeal.

The warranty does not apply in case of:

- Inappropriate transportation, storage or maintenance;
- Unauthorised opening of the device in case of warranty seals and labels.
- Repairing controller by someone or some organization not authorised by GalileoSky during the warranty period;
- Signs of electrical and/or other damage due to prohibitive mains parameter changes, misapplication and neglect of the device;
- Physical damage of the device body and board, SIM holder, aerials or wires break;
- Traces of oxidation of outer and inner parts or exposure of the device body to moisture;
- Theft or criminal damage of the external aerial or cable;
- Damages caused by foreign objects, substances, liquids, insects coming into body;
- Damage caused by exposure to high temperature or intense microwave radiation;
- Damage caused by elemental forces, fire, social factors, random external factors and accidents;
- Damage caused by parameters incompatibility or inappropriate attachment of additional devices or sensors to the terminal;
- Operation of the terminal by the vehicle network voltage deviating from the range mentioned in technical specifications.

Attention! The manufacturer shall in no case be liable for claims concerning the damage or loss of the data exceeding the cost of the product, as well as claims for incidental, special or consequential damages (including in each case, without limitation, damages for inability to use the equipment, loss of the data, loss of business, loss of profit, loss of savings, loss of time), arising out of the use or inability to use the equipment within legal limits.

Attention! The Warranty does not affect the statutory rights of the consumer, such as the guarantee of satisfactory quality of work or conformity of the product to the purpose for which analogous products are used under normal conditions and service maintenance and also your rights with regard to the seller of the product resulting from the fact of purchase and contract of sale and purchase.

Attention! Terms of Warranty service which are in conflict with the current law have no legal effect and are subject to the current law.

Attention! If the Purchaser fails to comply with the Terms of Warranty the validity of the Warranty is void.